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DYNAMIC STABILITY AND VIBRATION MONITORING FOR NO. 9 MINE, M-1 DUMP

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EXECUTIVE SUMMARY

The response of repose angle waste dumps at open pit mines to the effects of blasting has the potential to impact operations below the dump. The present study addresses the conduct of open pit mining operations at the toe of a five hundred foot high waste dump, known as the M-1 dump. The coal mining operation is in the South Pit at the Smoky River Coal Limited property near Grande Cache, Alberta. The study was conducted for CANMET (Contract No. 23440-7-9042/0150), with Dr. B.M. Das serving as the Scientific Authority.

In order to conduct safe mining operations at the toe of the M-1 waste dump, it was first necessary to assess the likelihood of a large volume of waste material moving downslope and impacting mining operations. An initial assessment of the impact of blasting on the waste dump was made, incorporating several conservative assumptions into the response analysis, including:

- the existence of saturated fine-grained waste rock near the toe of the dump (ie: material that could potentially suffer strength loss due to blast-induced pore water pressures)
- blast charge weights act in unison (ie: additive effect of delays)
- blast energy is transmitted in accordance with attenuation relationships developed for base metal mines, where the host rocks are generally more competent and better energy conductors than fractured sedimentary rocks.

Based on the results of analyses conducted to predict the potential for excess pore pressure generation (and proportional strength loss), it was estimated that a maximum strength loss of 20% could be expected for a total charge weight of up to 50,000 pounds of ANFO, and a 30% strength loss for total charge weights of up to 80,000 pounds. Based on the

observed deformation behaviour and static stability analyses, it was estimated that a strength loss of 10% over a significant portion of the dump could lead to instability. Given the conservative nature of the dynamic analysis, and the results of a subsequent excess pore pressure dissipation analysis that indicated any blast-induced down-slope deformation would likely occur as a "ratcheting", non-catastrophic event, it was concluded that the South Pit could be developed safely. However, in view of the unprecedented nature of the development, inherent uncertainties in the data and analytical methods used, and a commitment to safe mining operations, it was deemed prudent and necessary to monitor the deformation response of the dump after blasting to ensure dump stability prior to resuming activities in the pit area. It was also recommended to incorporate vibration monitoring, commencing with smaller charge weights, utilizing the results of site specific vibration attenuation measurements to provide a rational approach to assessing the impact of increasing the charge weights.

A total of 11 displacement prisms were installed and monitored intensively following each blast, and periodically between blasts. Up to 3 vibration monitors were utilized to monitor blast-induced vibrations both on and off the dump; a total of 25 vibration response records were obtained. In addition, daily records of climatic conditions were incorporated into the data base.

It was determined that using the average charge weight per delay, as opposed to the maximum weight per delay or total charge weight, results in the best correlation with the least amount of scatter. A

site-specific attenuation relationship was determined based on using average charge weight as follows:

$$p = A \left(\frac{D}{w}\right)^{-.94}$$

where p = particle velocity (in/s)
D = sloped distance from blast centroid (ft.)
w = average equivalent weight of ANFO per delay (lbs.)
A = constant = 8.4 (best fit)
= 13.6 (upper bound)

These results imply that the upper bound relationship used in the pre-blast assessment was conservative, as previously assumed. A review of vibration response data, comparing the response on native soil and at different points on the dump slope, leads to the conclusion that dump thickness did not significantly affect vibration attenuation.

A reassessment of excess pore pressure generation was made utilizing the site-specific attenuation relationship. Negligible excess pore pressures are predicted, implying that the effect of blasting on the dump was insignificant.

A review of dump deformation behaviour corroborates the analytical prediction of the negligible effect of blasting on short term dump deformation behaviour. Historical measurements of crest displacements of the portion of the M-1 dump nearest to the South Pit, combined with data from the present study, indicate that long term deformation behaviour was also not affected by mining activities in the South Pit. The deformation response of two lines of prisms established proximal to the South Pit for the present study and the behaviour of a remote

section of the dump monitored from 1983 to 1986, were thoroughly analyzed. The predominant influences on dump deformation response were found to be precipitation, foundation conditions, natural topography, waste dump thickness and the presence of degradable waste rock.

In summary, it is concluded that safe blasting may be carried out in proximity to repose angle waste rock dumps. Proper consideration of waste dump response must include an assessment of those predominant factors governing quasi-static deformation behaviour, historical dump deformation behaviour, and potential blasting effects. Monitoring of dump deformation behaviour and response to blasting provides a practical methodology for ensuring operational safety.

RESUME

La réponse à l'explosion de l'angle de talus des haldes dans les mines à ciel ouvert peut avoir un effet sur les opérations effectuées sous l'halde. Cette étude examine les exploitations minières à ciel ouvert à la base d'une halde d'une hauteur de cinq cents pieds appelée halde M-1. L'exploitation minière de charbon est située au South Pit dans la propriété de Smoky River Coal Limited près de Grande Cache, Alberta. L'étude a été faite par CANMET (Contrat No. 23440-7-9042/0150), sous la direction scientifique du Dr. B.M. Das.

Avant de procéder, en toute sécurité, aux travaux d'exploitation minière, il a d'abord fallu évaluer la probabilité d'un gros volume de déchets de roches en course descendante pouvant avoir un effet sur l'exploitation minière. Une première évaluation de l'effet de l'explosion sur la halde fut faite, l'analyse de la réponse tenait compte de plusieurs hypothèses traditionnelles, par exemple:

* la présence, près de la base de la halde, de déchets de roche à grain fin saturés (c'est-à-dire: des roches à potentiel de perte de résistance due aux pressions de l'eau interstitielle provoquées par l'explosion)
* action à l'unisson des charges explosives (c'est-à-dire effets additifs des retards)
* l'énergie de l'explosion se transmet conformément à l'équation de l'atténuation des mines métalliques, dans lesquelles les roches hôtes sont généralement de meilleurs conducteurs d'énergie que les roches sédimentaires fragmentées.

Les résultats des analyses faites en vue de prévoir le potentiel de génération de surpression interstitielle (et de perte de résistance proportionnelle), indiquent que pour une charge d'un poids total s'élevant à 50 000 livres de ANFO, il faut s'attendre à une perte de résistance maximale de 20% et de 30% pour une charge d'un poids total de 80 000 livres. On a déterminé à partir des analyses de comportement de déformation et de stabilité statique, qu'une perte de résistance de 10% sur une portion importante de la halde créerait une instabilité. Etant donné la nature traditionnelle de l'analyse dynamique, ainsi que les résultats d'une analyse subséquente de la dissipation de la surpression interstitielle indiquant que toute déformation en aval provoquée par l'explosion se fera "à cliquets", il a été conclu que le développement du South Pit peut se faire en toute sûreté. Toutefois, en raison de la nature sans précédent du développement, des incertitudes dans les données et des méthodes analytiques utilisées ainsi que des engagements pour la sécurité durant les travaux, il serait prudent et nécessaire de contrôler la réponse de la déformation de la halde après l'explosion afin de s'assurer de la stabilité de la halde avant que de commencer les activités dans la mine. Il est également recommandé de

procéder à un contrôle des vibrations, en commençant par de petites charges, en utilisant les résultats des mesures spécifiques des atténuations des vibrations afin d'aborder de manière plus rationnelle l'évaluation des effets qu'aurait une augmentation du poids des charges.

Au total, 11 prismes de déplacement furent installés pour un contrôle intensif après chaque explosion et un contrôle périodique entre les explosions. Jusqu'à 3 indicateurs de vibrations furent utilisés pour contrôler, à l'intérieur et à l'extérieur de la halde, les vibrations provoquées par l'explosion; un total de 25 enregistrements de la réponse des vibrations fut obtenu. En outre, des relevés quotidiens du régime climatique furent inclus dans la base de données.

Il a été établi qu'en utilisant une charge moyenne par retard, par opposition à la charge maximale par retard ou charge totale, on obtient la meilleure corrélation et une dispersion minimale. Une équation de l'atténuation d'un site spécifique a été établie en se basant sur l'utilisation de la charge moyenne:

$$p = A \left(\frac{D}{\sqrt{w}} \right)^{-0,94}$$

où p = vitesse des particules (pces/sec)
D = distance inclinée à partir du point d'explosion (pieds)
w = charge moyenne équivalent de ANFO par retard (livres)
A = constante = 8,4 (ajustement optimal)
= 13,6 (limite supérieure)

Ces résultats impliquent que l'équation de limite supérieure utilisée avant l'explosion était, comme nous l'avions supposé, traditionnelle. Une révision des données des réponses des vibrations, comparant la réponse sur le sol natif et à différents points de l'inclinaison de la halde, fait conclure que l'épaisseur de la halde n'affecte pas sensiblement l'atténuation de la vibration.

Une réévaluation de la génération de surpression interstitielle a été faite à l'aide de l'équation de l'atténuation d'un site spécifique. Des surpressions interstitielles négligeables sont prévues, laissant supposer que l'effet de l'explosion sur la halde est peu important.

Une révision du comportement de déformation de la halde confirme la prévision analytique de l'effet négligeable de l'explosion sur le comportement de déformation à court terme de la halde. Associées aux données de cette étude, les mesures faites au préalable des déplacements des crêtes de la portion de la halde M-1 la plus proche de South Pit indiquent que le comportement de déformation à long terme n'a, également, pas été affecté par l'exploitation minière dans le South Pit. La réponse de la

déformation des deux lignes de prismes situées près du South Pit pour cette étude et le comportement d'une portion éloignée de la halde contrôlé de 1983 à 1986, furent examinés soigneusement. Les précipitations, les conditions des fondations, la topographie naturelle, l'épaisseur de la halde et la présence de déchets de roches dégradables sont les facteurs déterminants de la déformation de la halde.

En conclusion, des explosions peuvent se faire en toute sûreté près de l'angle de talus de la halde. Une évaluation des importants facteurs déterminant le comportement de déformation quasi-statique, l'historique du comportement de déformation de la halde et les effets potentiels de l'explosion doivent être pris en considération dans la réponse de la halde. Le contrôle du comportement de déformation de la halde et la réponse à l'explosion offrent une méthodogie pratique en vue d'assurer la sécurité durant les travaux d'exploitation.

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1. INTRODUCTION AND SCOPE OF STUDY

Throughout the mineral industry in Canada, more emphasis is being placed on open pit mining and hence increased attention must be given to methods of disposal of waste materials. In the coal mining industry, more than 95 percent of the production is from surface mining.

The general practice for reclaiming mine waste dumps is to develop an overall slope not steeper than 26 degrees to assist in re-vegetation and to ensure long term stability. Increasing pressure to reduce mining costs has resulted in re-consideration of the practice of flattening repose angle slopes, or at least to delay the time of reclamation as long into the mining venture as possible. Little is known about the susceptibility of waste dumps, with exterior slopes approaching the repose angle condition, to failure due to mine blasting effects or earthquakes.

Smoky River Coal Limited (SRCL) has developed a new open pit in close proximity to the existing M-1 waste dump, which is close to the repose angle. The factor of safety of the dump prior to mining is close to unity, as a portion of the dump has experienced extensive deformation in the past.

SRCL initiated mining operations on the No. 9 mine "South Pit" in December, 1986. Prior to the beginning of mining, concerns were raised regarding the effects of blasting on the stability of the M-1 Dump which is located above the South Pit. The dump was constructed between 1972 and 1978 and has been subject to creep deformation, although it has not failed. The creep rate of the dump has been decreasing from 3.7 inches/day in September, 1983 to an annual rate of 4 feet in 1986.

In a previous report by Piteau Engineering Ltd. (1987), the static stability and potential effects of blasting vibrations on the stability of the M-1 Dump were addressed. Implicit in the analysis were a number of assumptions concerning blast induced vibration, attenuation and dump material response to the vibratory loading. It was recommended that during initial mining operations, displacement and vibration monitoring be undertaken to assess dump performance under blasting induced vibrations for safety of mine personnel and as a method of calibrating the analysis. A site plan showing the location of the M-1 Dump, pit plan and monitoring locations is presented in Figure 1.1.

The present study was conducted for CANMET (Contract No. 23440-7-9042/01SQ), and was developed to extend monitoring of the M-1 Dump to approximately 1 full year in order to assess seasonal response of the dump and to further evaluate the analysis methodology. The overall study was composed of four phases. As per Appendix "C" of the contract, the work tasks conducted were as follows:

Phase I: Preliminary study to evaluate the scope of work, documentation of analytical procedures, work plan and site preparation.

Phase II: Initial limited monitoring at SRCL M-1 Dump at start-up of South Pit Mining.

Phase III: On-going and extended monitoring at SRCL M-1 Dump; data acquisition and compilation.

Phase IV: Dynamic slope stability analyses, report preparation, and debriefing.

Analytical procedures to assess potential effects were originally developed for a worst case scenario which incorporated a saturated layer of dump material susceptible to generating excess pore pressures as a result of dynamic loading. Excess pore pressures would reduce effective inter-granular stresses, and hence the dump stability. Piezometers to monitor dynamic pore pressures in the dump were considered to be impractical, thus not allowing verification of predicted pore pressures or determination of dynamic slope stability.

As a result of the data generated during the conduct of the study, detailed assessments were made of the effects of various blasting parameters on observed dynamic response of the dump, as well as assessing procedures for developing site specific scaling relationships. In addition, creep behaviour of the dump was analyzed, with emphasis placed on developing an understanding of blasting, topographic, environmental and dump geometry effects on deformation behaviour and governing mechanisms. Although not strictly within the terms of reference, analysis of the long-term deformation behaviour of the M-1 Dump provides insight into factors affecting dump deformation behaviour and is therefore of interest to the present study.

2. BACKGROUND

2.1 SITE CHARACTERISTICS

2.1.1 Foundation Conditions

The M-1 Dump was placed on a steep south and southeasterly facing slope. Pre-dump topography varied from up to 38° in upper areas to 24° near the toe of the dump. Limited sections of the slope were as steep as 45°. A small area on the eastern portion of the toe was placed on a gentle slope of about 9°.

According to information contained in a report by R.M. Hardy and Associates (1977), the dump foundations consist of mixed grain colluvium in the upper portion and colluvium and glacial till in the lower portion of the dump.

A thin layer of organic soil was stripped from the toe area prior to placement of waste rock (SRCL, 1986). Glaciofluvial deposits are reported by R.M. Hardy and Associates to be present along the north bank of Sheep Creek, but are believed to be beyond the limit of the dump.

Borehole logs from test drilling performed by R.M. Hardy Associates in 1973 prior to placement of waste rock are provided in Appendix I. Locations of the test holes TH12, TH13 and TH14 are shown on Figure 1.1.

During an inspection of September 28, 1983 (Piteau Associates, 1983), several small seeps were observed to emerge from the waste

rock, near the toe of the dump. An accumulated discharge from the creek draining the M1 dump and part of the adjacent M2 dump to the west of approximately 1 - 2 cfs was estimated at the time of the site reconnaissance.

Recharge of groundwater originates from precipitation falling on the dump and in the level area behind the dump, above elevation 4850 ft. Runoff from much of the area behind the dump is in the direction of the slope on which the M1 dump is supported. The area is blanketed by coarse rock which allows rapid infiltration.

An interception ditch excavated at the crest of the north pit wall remained dry throughout the mining period. A shallow piezometer installed in TH13 at a depth of 10' was reported as dry after drilling. In addition, a shallow standpipe installed in the toe of the M-1 dump has remained dry throughout the study period.

During an inspection of September 8, 1987, small seeps at the colluvium/bedrock interface were observed near the crest of the north wall near the 4000 foot level bench.

Bedrock conditions were described in a previous report by Piteau Associates (1985). Lithology consists predominantly of fine to medium sandstone with lesser amounts of sandy siltstone, coal and carbonaceous shale.

The strata have undergone extensive structural deformation. The north wall of the No. 9 Mine South Pit occurs within the north limb of an anticline. The anticline structure plunges to the

west. Discontinuities in the rock mass consist of a number of thrust faults, slickensides, bedding joints and cross joints (Piteau Associates, 1985).

2.1.2 M-1 Dump

Sandstone, silty sandstone, siltstone, silty shale, mudstone, and coaly waste rock comprise the M-1 dump. The silty shale and mudstone are susceptible to slaking and related deterioration on exposure to air and water.

Two sections through the M-1 dump and one section through the M-1 dump east of the South Pit illustrating the natural slopes and dump profiles are shown in Figures 2.1, 2.2 and 2.3, respectively. Also shown are transverse sections showing thickness and cross-slope topography.

In addition, a contour plan of vertical dump thickness was prepared from original (pre-dump) and present topography. The thickness contours and section locations are shown in Figure 2.4.

Dump thickness along Section AA', located closest to the south pit, is generally less than 100 ft. The foundation slope angle varies between approximately 25° near the base, to 30° near the crest.

Dump thickness along section BB', located near the eastern limit of the south pit, is considerably greater than along section AA'. Dump thickness below Prism 10 is in excess of 350 ft. (Figure 2.2). Foundation slope angles range from less than 10° near the toe to approximately 20° below Prisms 10, 11 and 12 (Figure 2.2).

Section CC' is located on the east side of the M-1 dump, well away from the South Pit. However, it is considered relevant to this study because intermittent survey prism monitoring records are available for the period 1983 to 1986, prior to blasting in the No. 9 mine.

2.2 GENERAL ASPECTS AND NOMENCLATURE OF PRODUCTION BLASTING

Coal mining accounts for over 50% of consumption of explosive products (DuPont, 1977). Ammonium nitrate fuel oil (ANFO) is the most commonly used type of explosive due to low cost, approximately 20% that of gelatine dynamites.

ANFO prills were used in general for production blasts in the South Pit. Due to ANFO's poor water resistance, however, gelatine explosives in slurry form were used when significant groundwater inflows were encountered.

The purpose of production blasts is to sufficiently fragment material to facilitate removal and handling. Care must be exercised when blasting ultimate pit wall to minimize overbreak.

General aspects of a production blast are shown on Figure 2.5. The drilling pattern involves selection of hole spacing, hole depth and burden (distance from free face to first row). The sequence involves selection of delay periods between rows and the order in which rows and holes are initiated. The delay period between rows was 50 milliseconds for all blasts in the South Pit. For the pattern shown in Figure 2.5, the rows would be initiated in the sequence 1, 2 and 3. By initiating

row 1 first, the material is already moving to the right when row 2 is initiated. The end result is the blasted material is in a looser state for subsequent excavation. If row 3 is initiated first, extremely high confining pressures in materials adjacent to the blastholes are generated by gases produced from the blast. This results in crushing of the surrounding material, not proper fragmentation, as desired.

Blasting caps can detonate cap sensitive explosives such as dynamite, however, ANFO is relatively insensitive and must be detonated with a small explosive called a primer which is detonated by a blasting cap (see detail on Figure 2.5).

2.3 EFFECT OF BLASTING VARIABLES ON VIBRATION LEVELS

In a series of controlled experiments at four surface coal mines in the United States, Wiss et al. (1978) documented the effect of a number of blast parameters on ground vibration levels, as summarized on Table 2.1

Variables within the control of mine operators which are most significant are charge weight per delay and length of delay. Burden, spacing and direction of blast initiation had moderately significant effects.

Type and depth of overburden was described as having a moderately significant effect on vibration levels, but is not under the control of the operators. General surface terrain was found to be insignificant, however, the four surface mines studied had very gentle topography and uniform overburden conditions in relation to the South Pit/M-1 Dump area.

As described in Section 5.1, the results of this study reveal that the relatively thick cover of loose waste rock does not significantly decrease particle velocity levels, which is the traditional parameter used to define blast induced vibration response magnitude. Another factor considered important in this study is the effect of geologic structure on vibration levels. In general, the rock quality at the No. 9 Mine, South Pit is poorer (contains more discontinuities) than at Interior Plains coal mines studied by Wiss et al. Geologic structure has an important effect on the transmission velocity of seismic waves and is related to the rate at which particle velocities decay from the blast source (Dowding, 1985).

2.4 WAVE PROPAGATION

Explosion-generated seismic waves can be divided into three categories: compression, shear and surface waves.

i) Compression Waves:

Particle motion in a compression wave is in the same direction as the wave is propagating (Figure 2.6). Compression waves travel at a higher velocity than shear or surface waves. During analysis of seismic records from earthquakes, compression waves were always the first to arrive, hence the name Primary Wave was adopted. For this reason, they are often called P waves. The P wave velocity depends on the elastic constants and in situ density of the propagation medium. In general, geologic structures such as faults and joints reduce the velocity of seismic waves for a given geologic material.

ii) Shear Waves:

Particle motion for shear waves is more complex than for P waves. Motion is in a direction perpindicular to the direction of wave propagation as shown in Figure 2.6. Shear waves are commonly called S waves and they travel slower than P waves, hence were identified as secondary waves on earthquake records.

iii) Surface Waves:

Surface waves comprise two types: Rayleigh waves and Love waves. Of these types, Rayleigh waves are dominant, hence Love waves are not discussed. Particle motions for Rayleigh waves are similar to water waves. Particles describe a retrograde (in this case counter clockwise) ellipse as the wavefront passes. Surface waves, as the name implies, are confined to the free surface. The amplitude of these waves decreases exponentially with depth.

Although seismic wave transmission theory is generally well understood and documented (eg. Telford et al, 1976), the approach in blasting seismology has generally been to determine empirical relations between ground vibration levels and damage to structures.

Analytical methods to predict vibration levels from blasts in surface mines are complicated by a number of factors. For example, multiple delays combined with different velocities for P, S and Rayleigh wave types result in interference of successive wave trains. Complex geological conditions at the No. 9 mine, such as highly variable overburden thickness and contorted bedrock result in reflection and refraction of seismic waves in a manner that is generally impossible to interpret. However, several records did provide clear indications of P, S and Rayleigh wave arrivals, as illustrated in Figure 2.7.

The transmission velocity of P, S and Rayleigh wave types depends on the elastic properties and density of the progagation medium. Since geologic structure reduces transmission velocities, particle velocities are in turn also reduced.

The effect of topography and subsurface inhomogeneity on Rayleigh Wave transmission was investigated by Ohtsuki et al (1984). These authors incorporated a numerical approach to model amplification of surface waves at topographic discontinuities (cliffs), and concluded that geometrical effects on wave amplitude are significant.

2.5 DYNAMIC STABILITY OF SLOPES

The dynamic stability of slopes has traditionally been evaluated for earthquake loading conditions, however, many of the concepts can be utilized to assess the stability of slopes under blast-induced dynamic loading. The primary difference is the significantly shorter duration of blast-induced dynamic loading.

Several methods have been developed to assess the dynamic stability of slopes. The simplest, often used and mis-used approach, is the pseudo-static analysis which essentially is a static equilibrium analysis modified to incorporate a constant horizontal inertia force. A horizontal seismic coefficient is selected based on the intensity of the dynamic input, and the factor of safety against sliding along potential slip surfaces is calculated. A factor of safety less than unity implies a condition of failure, regardless of duration of loading. For the present study of a repose angle slope, whose static factor of safety is near unity, even low levels of dynamic input would result in a pseudo-static factor of safety less than unity thus implying slope failure, an

inappropriate conclusion based on observations of performance. Cautionary notes regarding the use of the pseudo-static method are presented in the literature (Seed, 1973). Although useful for preliminary evaluations, the pseudo-static method has limited applicability to the present study.

Newmark (1965) developed a procedure to evaluate the dynamic stability of slopes by combining the pseudo-static procedure with basic dynamic considerations. The method provides an estimate of potential plastic displacement as a result of ground shaking, and incorporates effective stress analysis to account for pore pressure generation due to cyclic shear stresses; although only the maximum estimated excess pore pressure is typically used. The Newmark method is a reasonably simplistic approach that has applicability to assessing plastic deformations resulting from blast induced dynamic loading, particularly if the dynamic history and accompanying excess pore pressures can be adequately estimated for input into the analysis.

Numerous numerical dynamic analyses have been developed that can be utilized to estimate dynamic stresses and deformations induced in slopes. Dynamic models solve for the equations of motion, considering inertial forces, viscous damping and material stiffness. An equivalent elastic or elastic-plastic stress strain model is generally utilized. The resulting stresses and displacements can then be used to define laboratory cyclic shear test conditions to evaluate pore pressure generation and subsequently slope stability. Alternatively, an elastic stress strain model, incorporating a pore pressure generator (typically based on cyclic shear test results) can be utilized to allow soil softening as a result of dynamic loading. Dynamic analyses have been used successfully to predict embankment performance (Seed, 1973), given the results

from laboratory cyclic shear tests conducted under conditions closely approximating the in situ soil conditions. Any one of several dynamic analyses being applied routinely could be utilized to assess the dynamic response of a slope to blast-induced vibrations, given sufficient understanding of the boundary conditions, the dynamic history and appropriate cyclic shear test data.

Plasticity models (Mizuno and Chen, 1984) have been utilized to analyze slopes under seismic loading conditions. Such models have received limited verification and are not developed to a state that could be utilized effectively for predicting blast-induced response of repose angle slopes.

2.6 STATIC SLOPE DEFORMATION

Varnes (1978), based upon an extensive study of slope movement types and processes, developed a classification chart to describe slope deformation behaviour. An abbreviated version of this chart is shown in Table 2.2.

The types of slope movement have been divided into five main groups (falls, topples, slides, spreads and flows). A sixth complex group involves a combination of two or more of the five main groups. Materials are divided into rock and engineering soils.

Slope movement can occur within the dump itself at the interface of the natural soil and the dump, or within the foundation material itself. A typical mechanism is the stick-slip movement described by Ko and McCarter (1973). Their observations of pit slope movement indicate that the movement can be described as a series of successive increments or

stick-slip steps. The displacement "u" is described by Ko and McCarter using the following equation:

$$u = \frac{f}{k}\left(1 - e^{\frac{-Kt}{N}}\right) + u_0$$

Where u = displacement; u_0 = limited displacement
f = force difference; K = elastic coefficient
N = viscosity coefficient; t = time.

Precipitation effects are assumed to produce a reduction in the viscosity. Changes in the magnitude of the amplitude of the successive stick-slip steps were found to correlate to blasting magnitude. This form of analysis could not be applied to the present data due to the fact that continuous displacement montoring is required to describe the displacement time behaviour during each of the stick-up steps, whereas intermittent monitoring was employed.

Another typical deformation mechanism is reflected in a progressive failure mechanism discussed by Chowdury (1969). Progressive failure results from non-uniform stress and strain conditions developing within the slope.

Creep is an important component of the overall slope movement process, whether occurring within the mass of the dump or at the dump/foundation interface. Creep of soils has been extensively studied utilizing the rate process theory (Mitchell, 1964).

The displacement velocity or creep rate of a slope under earthquake loading has been studied by Finn (1966). The basis of Finn's analysis

is that the slope can be considered as an infinite layer under a pseudo-static earthquake force. The velocity u_a is described by the following relationship:

$$u_a = \frac{c\,(h - Ya)^2}{2nYa}$$

Where c = cohesion
h = dump thickness
n = viscosity
Ya = depth of flow

For the purposes of the present study, time-dependent slope deformation is examined and fundamental creep behaviour is assessed to develop an understanding of deformation mechanisms controlling dump behaviour.

Stability, performance and operation of waste dumps on steeply sloping terrain is reviewed by Gold (1986) and Campbell (1986). Dump deformations are assessed in terms of a double wedge model, whereby an upper active wedge is supported by a toe wedge. Crest vertical displacements are attributed to compaction of the waste rock and shear strains within the mass of waste rock. A case history cited observations of modest flattening of the slope in the upper two thirds of the dump and modest steepening within the lower third of the dump face. Although no methodology for predicting dump deformations or displacements was presented by Gold or Campbell, general observations of dump performance are of interest to the present study.

General aspects of waste dump deformation regarding waste rock characteristics, natural topography, foundation materials, and groundwater conditions are discussed in Section 6.1.

TABLE 2.1

EFFECTS OF BLASTING VARIABLES ON VIBRATION LEVELS

Variables within the control of mine operators	Influence on ground motion		
	Signif.	Moderately signif.	Insignif.
1. Charge weight per delay	X		
2. Length of delay	X		
3. Burden and spacing		X	
4. Stemming (amount)			X
5. Stemming (type)			X
6. Charge length and diameter			X
7. Angle of borehole			X
8. Direction of initiation		X	
9. Charge weight per blast			X
10. Charge depth			X
11. Bare vs. covered detonating cord			X
Variables not in control of mine operators			
1. General surface terrain			X
2. Type and depth of overburden		X	
3. Wind			X

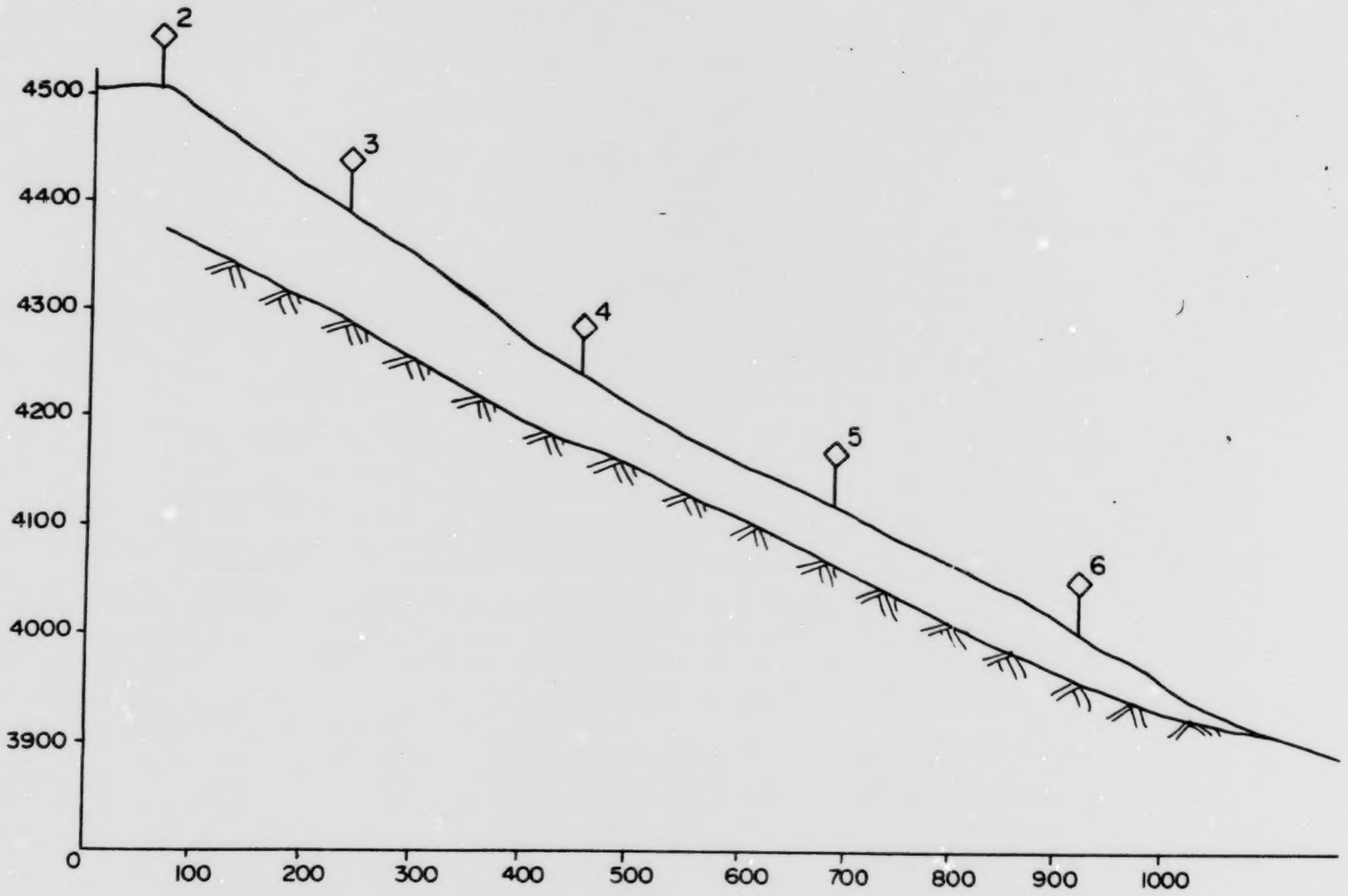
(After Wiss et al, 1978)

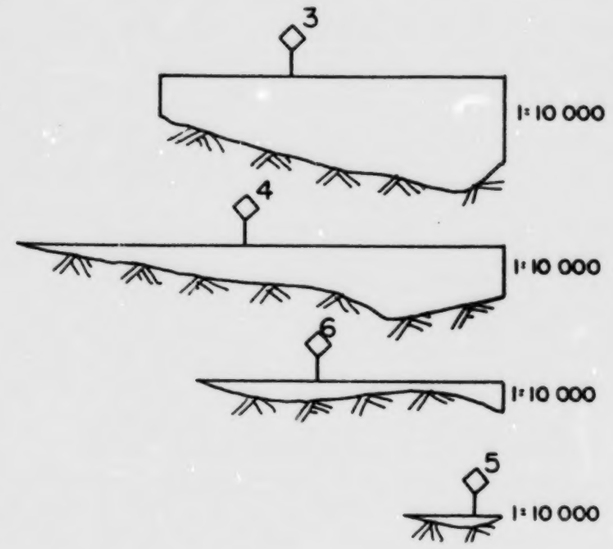
TABLE 2.2

CLASSIFICATION CHART FOR SLOPE MOVEMENT

TYPE OF MOVEMENT		TYPE OF MATERIAL		
		BEDROCK	ENGINEERING SOILS	
			Predominantly Coarse	Predominantly Fine
Falls		Rock fall	Debris fall	Earth fall
Topples		Rock topple	Debris topple	Earth topple
Slides				
- Rotational		Rock slump	Debris slump	Earth slump
- Translational	Few Units	Rock block slide	Debris block slide	Earth block slide
	Many Units	Rock slide	Debris slide	Earth slide
Lateral Spreads		Rock spread	Debris spread	Earth spread
Flows		Rock flow (deep creep)	Debris flow (soil creep)	Earth flow
Complex		Combination of two or more principal types of movement		

(After Varnes, 1978)





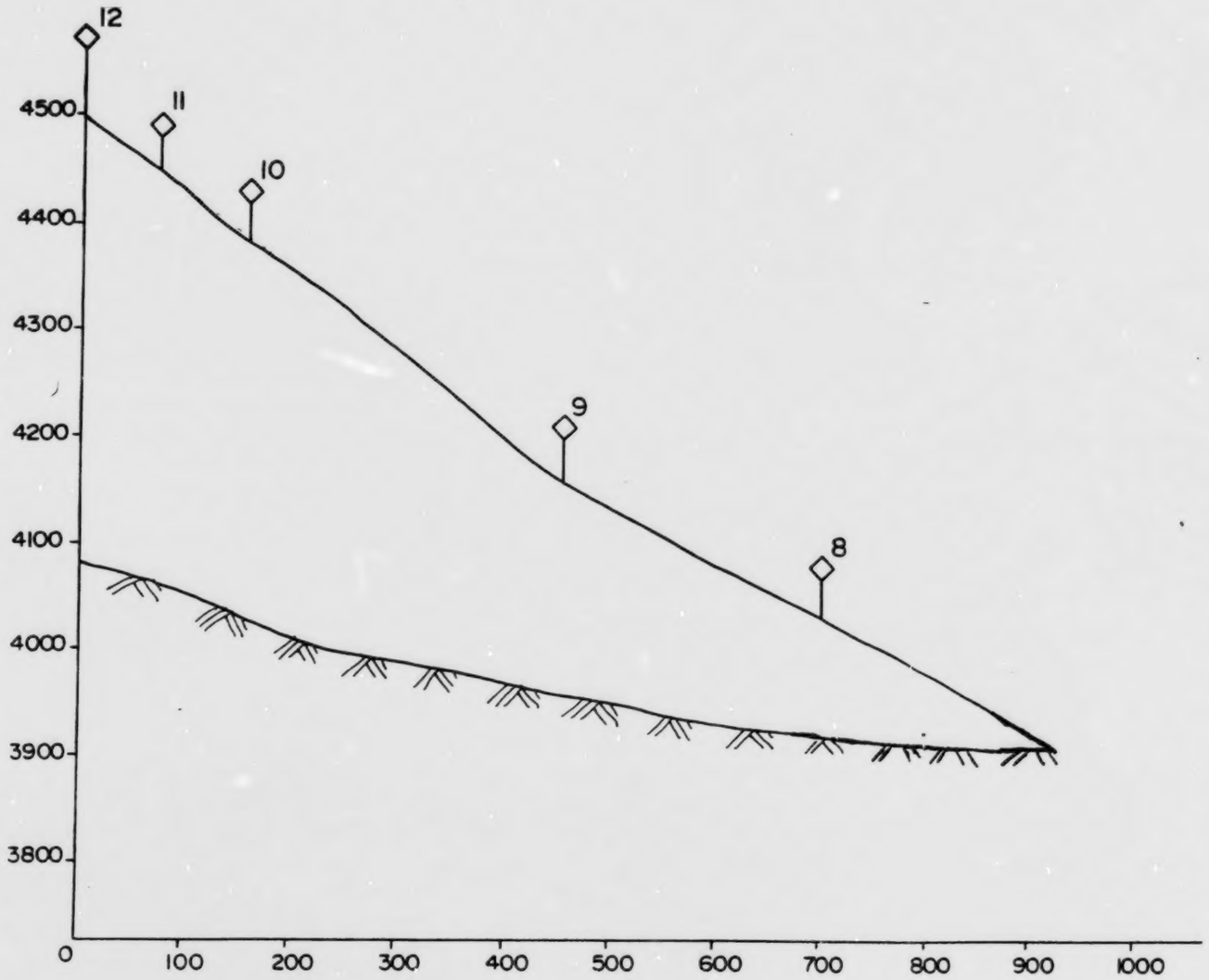
SMOKEY RIVER COAL LIMITED - CANMET
DYNAMIC STABILITY OF
M-1 DUMP

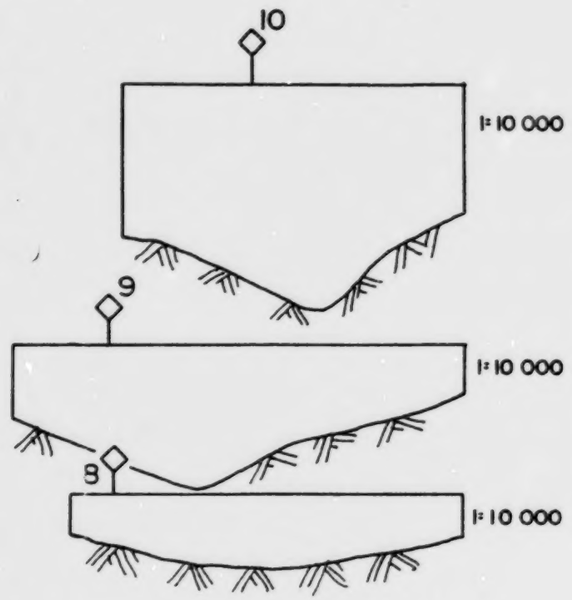
PITEAU ENGINEERING LTD.
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

SECTION A-A'

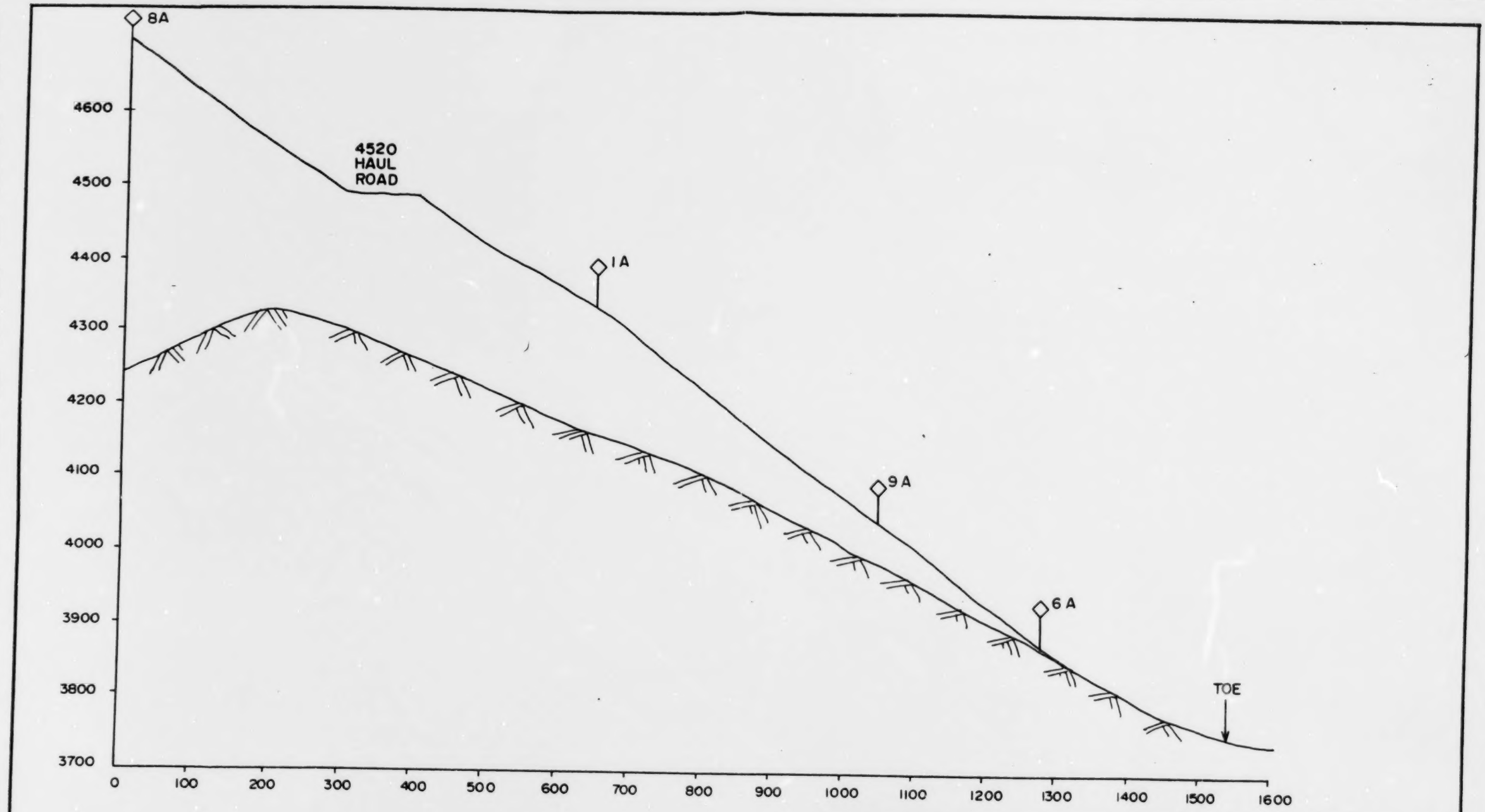
BY: MVC
DATE: FEB. 88
APPROVED:
FIGURE: 2.1

962-4





SMOKEY RIVER COAL LIMITED - CANMET DYNAMIC STABILITY OF M-1 DUMP	PITEAU ENGINEERING LTD. GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS VANCOUVER CALGARY		
SECTION B-B'		BY: MVC	DATE: FEB. 88
		APPROVED: BH	FIGURE: 2.2

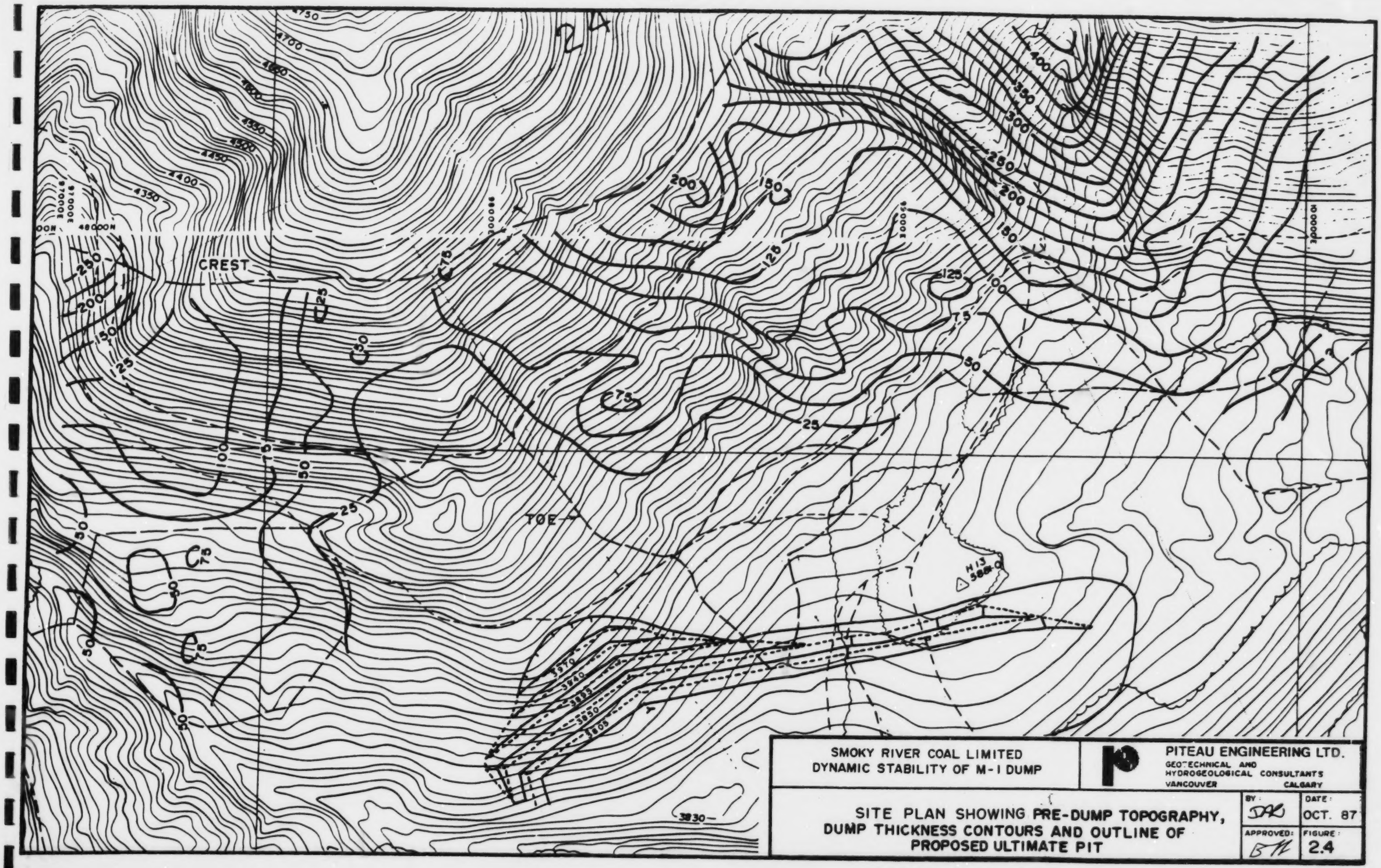


SMOKEY RIVER COAL LIMITED - CANMET
DYNAMIC STABILITY OF
M-1 DUMP

PITEAU ENGINEERING LTD.
GEOTECHNICAL AND
HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

SECTION C - C'

BY:	DATE:
MVC	FEB. 88
APPROVED:	FIGURE:
	2.3


CREST
TOE
CL
M13
3880
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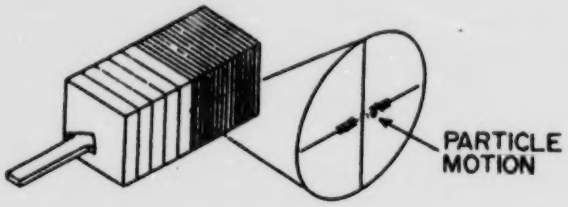
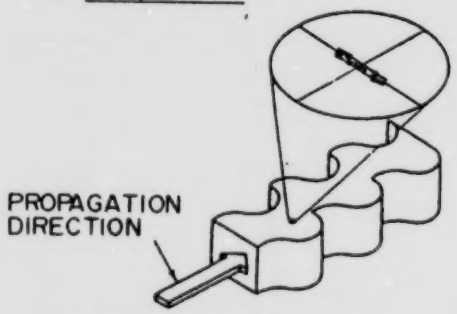
300016

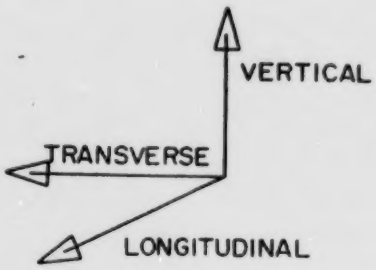


a) Compression



b) Shear

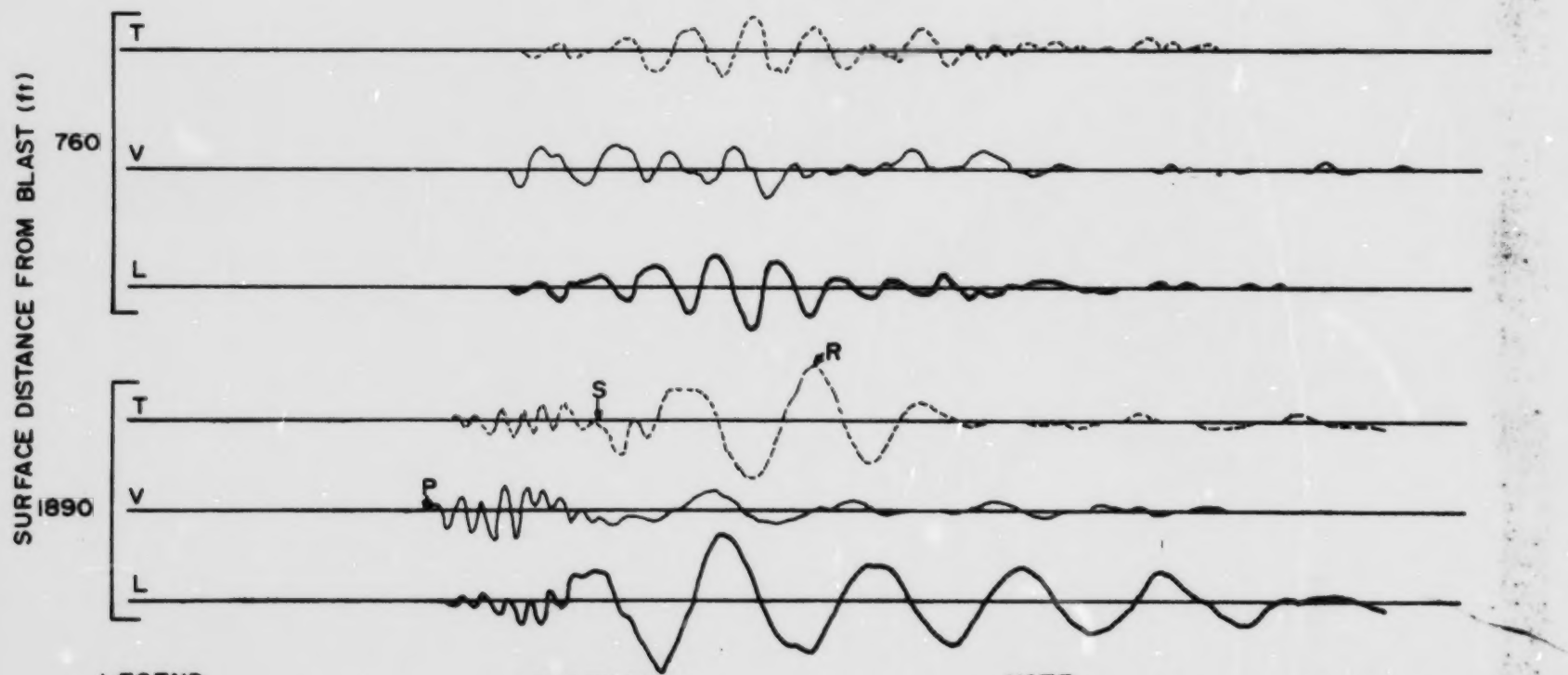
c) Rayleigh



COORDINATE SYSTEM FOR PLACEMENT OF VIBRATION TRANSDUCER

DIRECTION OF BLAST RELATIVE TO TRANSDUCER LOCATION

SMOKY RIVER COAL LTD - CANMET M-1 DUMP STABILITY	PITEAU ENGINEERING LTD. GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS VANCOUVER CALGARY	
PARTICLE MOTION FOR COMPRESSION, SHEAR AND RAYLEIGH WAVE TYPES	BY: MVC	DATE: MAR 88
	APPROVED: BH	FIGURE: 2.6



LEGEND

- TRANSVERSE
- VERTICAL
- LONGITUDINAL

BLAST DATA

DATE NOV. 26, 1987
NO. 3625-6
FOUR ROWS
FIVE 50 MILLISECOND DELAYS

NOTE

FOR ILLUSTRATIVE PURPOSE, NOT TO SCALE

P= COMPRESSION WAVE
S= SHEAR WAVE
R= RAYLEIGH WAVE

SMOKY RIVER COAL LIMITED - CANMET
M-I DUMP STABILITY

PITEAU ENGINEERING LTD.
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CANADA

COMPARISON OF TWO PARTICLE VELOCITY GRAPHS MEASURED DURING THE SAME BLAST AT DIFFERENT SURFACE DISTANCES

BY: MVC

DATE: JAN. 88

APPROVED:

FIGURE: 2.7

3. FIELD MONITORING

The field tasks involved the installation and operation of a survey prism network to monitor displacements, as well as implementation of a vibration monitoring system. In addition, a standpipe piezometer was installed near the toe of the dump and during a previous program, a piezometer was installed in the 4520 haul road. The location of all instrumentation and monitoring equipment is shown on Figure 1.1.

A total of 10 survey prisms (two lines of five each, Sections AA' and BB') were installed on the M-1 Dump, one was located on native colluvium near the toe of the dump and one was installed on flat terrain in the valley bottom as a control point. In addition, historical data of dump deformation were collected for a third line of prisms (Section C-C') installed on the dump to the east of the South Pit.

Vibration monitoring equipment was used to record particle velocity records at selected locations. Between one and three pieces of equipment were generally provided to monitor blast vibrations. Vibration monitoring equipment was placed on location immediately prior to blasting.

Particle velocity transducers were either spiked and weighted with a sand bag or simply weighted with a sand bag to couple the transducer to the ground. Spiking the transducer was sometimes difficult on the loose, angular dump material making it difficult to level. Although most velocity transducers currently manufactured (eg. Nomis and Instantel) provide a hole for spiking, Dowding (personal communication, 1988) has stated the preferred method is burial of the transducer. When the

transducer is subject to accelerations greater than 1 g, the sand bag will not remain in contact with the transducer. Also, if the transducer is spiked to the ground, it may behave like a mass on the end of a stick, generating a localized modal response not representative of the true ground motion.

Meteorological data were collected to provide a daily precipitation record. Temperature data were also incorporated into the data base to permit evaluation of potential effects of meltwater infiltration into the dump.

3.1 VIBRATION MONITORING EQUIPMENT

Instantel DS 377

The Instantel DS 377 is a digital vibration monitoring seismograph which utilizes a single transducer with 3 orthogonal components. The quantities measured are longitudinal, transverse and vertical particle velocity. Each channel has a range from 0 to 8 in/s (200 mm/s). The resolution is 0.0625 in/s at full scale (200 mm/s).

Sprengnether VS 1200

The Sprengnether VS 1200 is an analogue vibration monitoring seismograph which utilizes motor-driven, light-sensitive film and galvanometers to record particle velocities. A single transducer is used which can measure 3 orthogonal components of particle velocity. Each channel has a range from 0 to approximately 1 in/s (25 mm/s).

Nomis NCSC 5200

The Nomis NCSC 5200 is a digital vibration monitoring seismograph which utilizes a single transducer with 3 orthogonal components. Each component has a range from 0 to 4 in/s (100 mm/s) maximum. The resolution is ± 3% at 160 hz.

3.2 DISPLACEMENT MONITORING EQUIPMENT

An AGA Geodimeter model 136 is used to monitor the M-1 Dump movement by reading the displacement of reflective prisms mounted on the dump and adjacent native material. The prisms are 3 inches in diameter and are constructed from cut glass and sealed with silicone in specially constructed, moisture proof steel guards. The instrument has a distance accuracy of ± 0.20 in (5 mm) over any distance plus an atmospheric correction error of ± 5 ppm. Angles can be measured to an accuracy of ± 3 seconds mean standard error.

3.3 PIEZOMETER INSTALLATION

A piezometer was installed near the toe of the M-1 Dump on February 27, 1987. A log of the drillhole showing geologic materials and piezometer construction is provided in Appendix I. The completion zone of the piezometer is located in bedrock and it has contained only a trace of water to date.

3.4 METEOROLOGICAL MONITORING

SRCL maintains a weather station located at the plant site (elevation 3,300 ft, approximately). Measurements of wind speed, direction,

temperature, barometric pressure and precipitation are made 4 times daily. Although the M-1 Dump is approximately 800 ft. higher in elevation than the plant site, precipitation and temperature data are considered to be reasonably representative of conditions at the dump.

4. DATA COLLECTION AND REDUCTION

4.1 BLAST DATA

During the period March 1 to November 30, 1987 a total of 38 blasts were set off in the South Pit. Pertinent data summarizing blast locations, total charge weight and maximum charge weight per delay were recorded for each blast and are summarized in Appendix II. In addition, for a selected number of blasts, the patterns and sequences were analyzed in detail and are discussed in Section 5.2.

Reduction of blasting data involves calculation of the scaled distance. Two variables are necessary to calculate scaled distance, the slope of distance, D from the centre of the blast to the monitor location and the application charge weight W. The charge weight is usually taken to be the maximum weight of explosive per delay period. Two methods of calculating scaled distance are commonly employed. These are cubed root and square root scaled distance:

Cubed Root Sclaed Distance = $D/W^{1/3}$
Squared Root Scaled Distance = $D/W^{1/2}$

The slope distance between the blast and monitor involved calculation of the centre of the blast pattern. The easting and northing were chosen based on a visual inspection of the sequence in plan. The elevation of the centre was selected by adding 20 feet to bench height for each particular blast, which is the first four digits of the blast No. (Appendix II). This choice of elevation is justified by the fact the South Pit utilizes 45 ft. benches, in general.

Data concerning charge weights were recorded at the time of loading the blast holes. Maximum weights per delay period were calculated once the final blasting circuit was determined. Of note is the fact that two explosive types were used during the mining period, ANFO and gelatine slurry. Since the gelatin slurry has a weaker charge strength, all slurry weights were converted to equivalent ANFO weights (Appendix II).

Blast magnitudes, in terms of the inverse of the scaled distance, determined at each prism for each blast are shown plotted in Figures 4.1 through 4.12.

4.2 DISPLACEMENT MONITORING.

For each blast, the survey prisms were intensely monitored prior to and immediately following the blast, according to a pre-determined schedule. Less frequent survey measurements were made between blasts.

After each blast, the prism network was generally surveyed every 20 to 40 minutes for a period of 2 hours. After the 2 hour period, measurements were initially made on a semi-weekly basis, with subsequent reduction to a weekly basis.

Displacement data including northing, easting and elevation were recorded and stored using a Hewlett-Packard micro-computer for subsequent analysis. Tabulated displacement data for each prism are presented in Appendix III. Plots of total cumulative components dispoacement for individual (Easting, Northing, Vertical) are also presented in Appendix III. Plots of total cumulative displacement versus time for individual prisms (Prisms 1 through 12) are presented in Figures 4.1 through 4.12.

4.2.1 Field Measurement Error

Prior to discussion of the displacement results pertaining to Sections AA', BB' and CC', field measurement error will be briefly discussed. Prism 1 is located within the valley on relatively flat terrain, distant from the blast area and was utilized as the surveying benchmark. Therefore, the data obtained at this prism location has been analyzed to assess field measurement error. Figure 4.13 presents the plots of total cumulative displacement (TCD), as well as cumulative displacement in the vertical (TCVD), east (TCED), north (TCND), and horizontal directions (TCHD) versus time for Prism 1. As expected, no trends in displacement are exhibited, the variability of the data being a reflection of measurement error. A linear regression analysis was undertaken on the data, the results of which are summarized in Table 4.1. A perusal of the results indicate that the field measurement error is in the order of $\pm$ 0.1 ft. Based on survey instrument specifications presented in Section 3.2, the expected level of error is between $\pm$ .025 ft. and $\pm$ .035 ft. depending on prism location.

4.2.2 Data Manipulation

Basic surveying data for Prisms 1 to 12 and 1A to 9A are presented in tabular format in Appendix III. The tabulated data include date, time, easting and northing and elevation. To facilitate analysis and interpretation, these data were compiled using a Hewlett-Packard micro-computer system.

The first step in the analysis was to expand the basic data base to include the values of total cumulative displacement in the north, east, horizontal and vertical directions. Table 4.2 presents a list of these parameters and their method of calculation.

An initial examination of the initial plots of TCD, TCVD, TCND, TCED and TCHD versus time indicated that the data would have to be amended prior to analysis. Two main forms of data amendment were undertaken as follows:

a. Averaging of the values within the period of blasting due to uncharacteristically erratic data immediately following blasts; and,
b. Off-setting of data corresponding to the physical realignment of a prism.

Figure 4.14 presents a typical set of pre and post amended data.

4.3 VIBRATION MONITORING

A total of 25 particle velocity records were collected during the period March to December, 1988. Individual vibration records are presented in Appendix IV.

One objective of vibration monitoring was to produce a peak particle velocity vs. scaled distance relationship which is applicable to the South Pit/M-1 Dump. The general form of this relationship is as follows:

$$V_p = a\ (D/W^{1/2})^b$$

Where V_p = Peak Particle Velocity (Peak Vector Sum)
D = Distance From Blast to Measurement Point
W = Maximum Charge Weight per Delay
a,b = Site Specific Coefficient and Exponent

Analysis of vibration monitoring data requires blasting parameters to determine scaled distance from the blast to the vibration monitor. Particle velocity graphs were used to determine the peak particle velocity. The distance, D, was obtained from coordinates of the centroid of the blast relative to the point of interest, as discussed in Section 4.1. The vibration monitors were placed at predetermined locations of known coordinates with the intent that the effect of dump thickness on vibration attenuation could be determined.

The particle velocity typically used for the attenuation relationship is the peak vector sum. The vector sum is the magnitude obtained from the three individual particle velocity components (vertical, longitudinal and transverse). Earlier blast monitoring equipment measured only one component of particle velocity. Due to the complex particle motion of P, S and Rayleigh wave types, it is necessary to have three orthogonal components to characterize peak particle velocities. The peak vector sum is the largest value obtained from all components at a fixed point in time. The digital seismographs (Instantel DS 377 and Nomis NCSC 5200) calculate the peak vector sum automatically. The peak vector sum must be calculated manually from the analogue seismograph. An example calculation is shown beside record A on Figure 4.15. This calculation is repeated at several points until the largest value is determined.

4.4 METEOROLOGICAL DATA

Meteorological data collected during the study are shown summarized in Figures 4.1 through 4.12. Temperatures shown plotted are the maximum and minimum daily temperatures recorded at the plant site. Precipitation data plotted represent the total daily equivalent rainfall.

TABLE 4.1

LINEAR REGRESSION ANALYSIS
OF PRISM #1 DATA

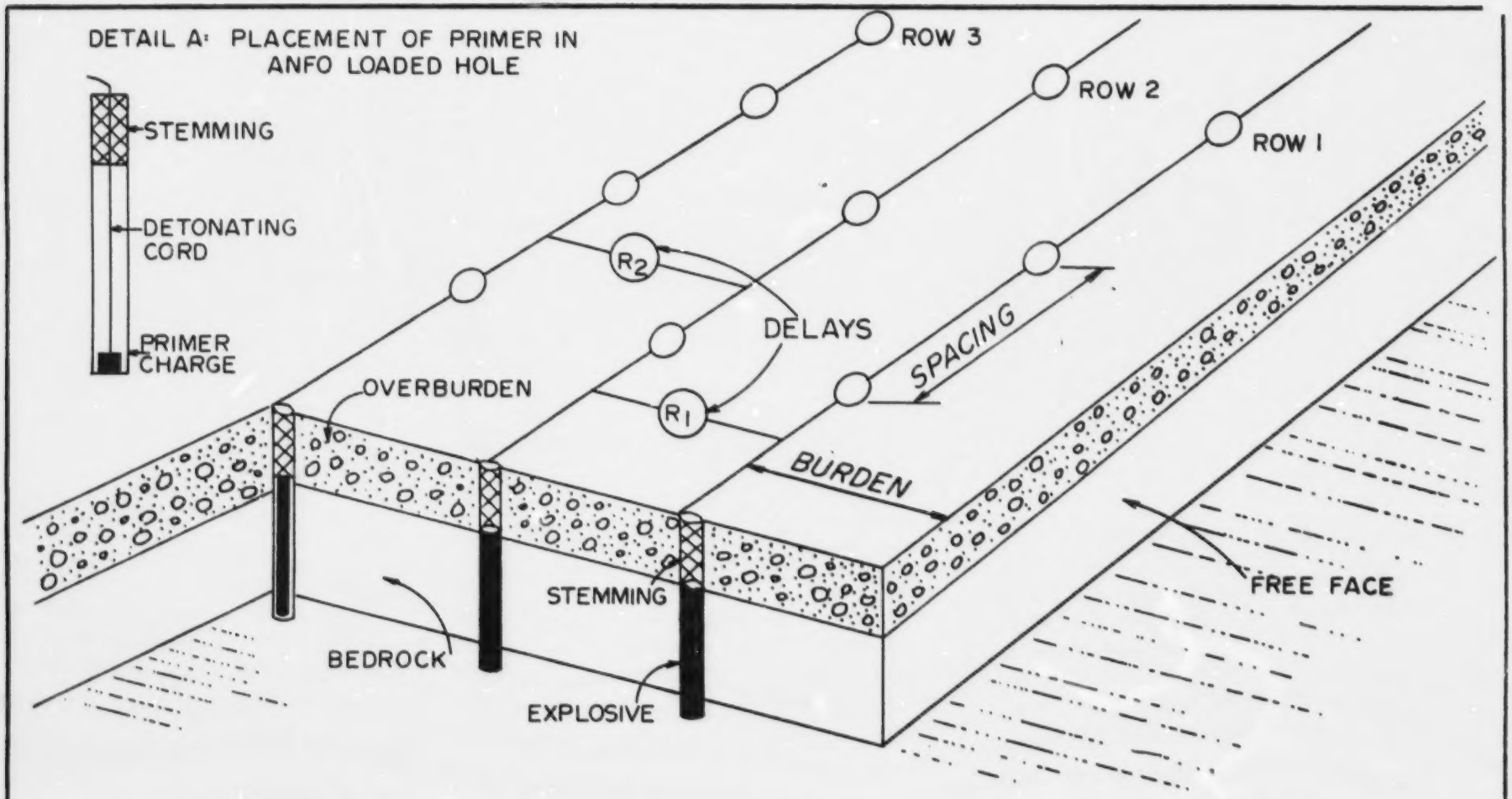
VECTOR TYPE	MEAN $\pm$ 1 STD (y-axis)	INTERCEPT	SLOPE
TCD	+ 0.0542 $\pm$ 0.0316	+ 0.0546	.0001
TCH	+ 0.0234 $\pm$ 0.0121	+ 0.0222	.0001
TCED	- 0.0088 $\pm$ 0.0073	-0.0044	.0001
TCND	+ 0.0061 $\pm$ 0.0209	-0.0078	.0001
TCVD	- 0.0382 $\pm$ 0.0442	-0.0480	.0001

TABLE 4.2

SUMMARY OF DISPLACEMENT AND
DIRECTIONAL PARAMETERS

PARAMETER	CALCULATION FORMAT	DESCRIPTION
TCVD	$TCVD = Elev - Elev_i$	Total Cumulative Vertical Displacement
TCND	$TCND = N - N_i$	Total Cumulative North Displacement
TCED	$TCED = E - E_i$	Total Cumulative East Displacement
TCHD	$TCHD = [(N - N_1)^2 + (E - E_1)^2]^{1/2}$	Total Cumulative Horizontal Displacement
TCD	$TCD = [(N - N_1)^2 + (E - E_1)^2 + (Elev - Elev_1)^2]^{1/2}$	Total Cumulative Displacement
N	$N = \arctan (TCED/TCND)$	Angle From North (Azimuth)
H	$H = \arctan (TCVD/TCHD)$	Angle From Horizontal

NOTE: N = northing
E = easting
Subscript "i" = initial.

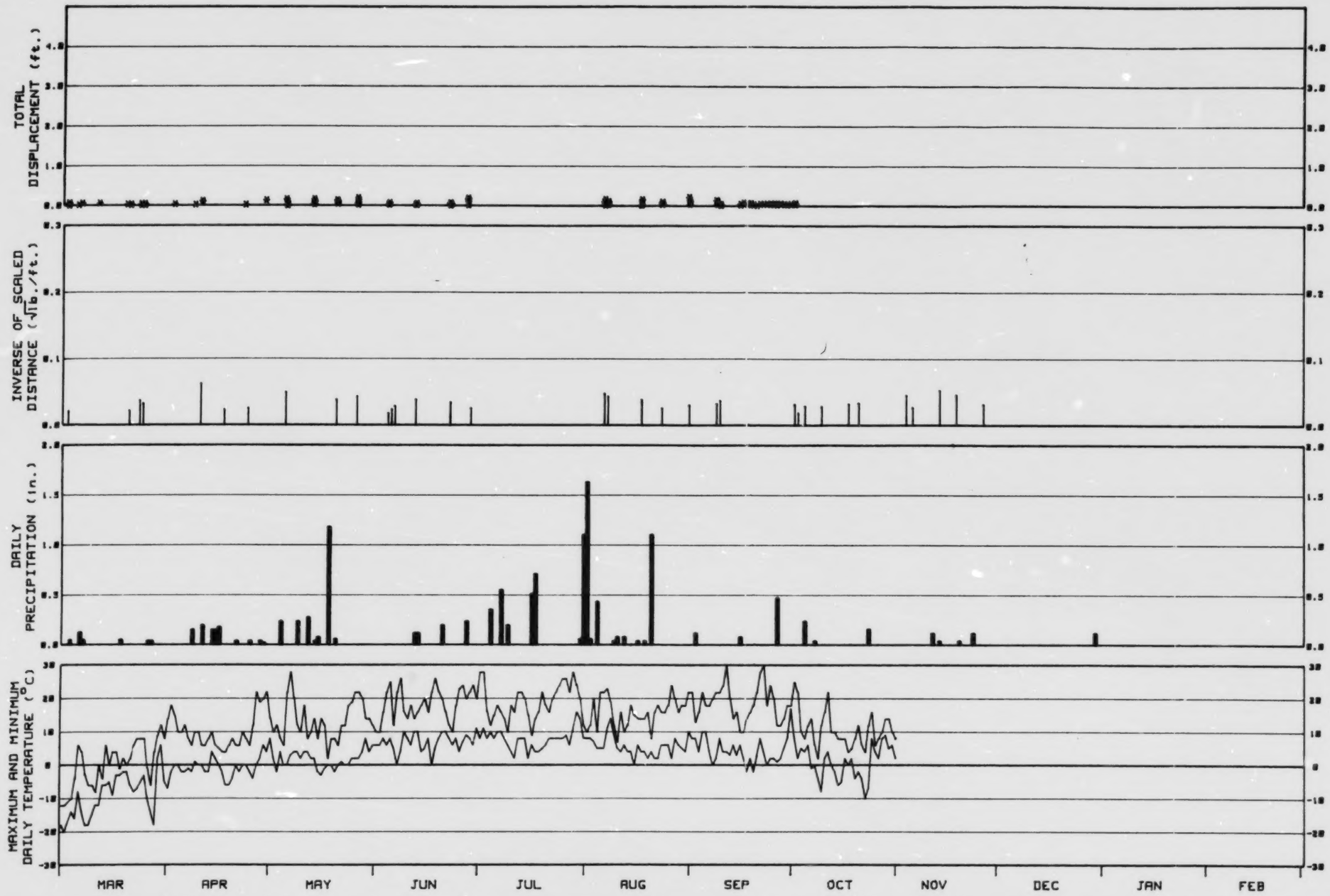


SMOKY RIVER COAL LTD. - CANMET
M-1 DUMP STABILITY

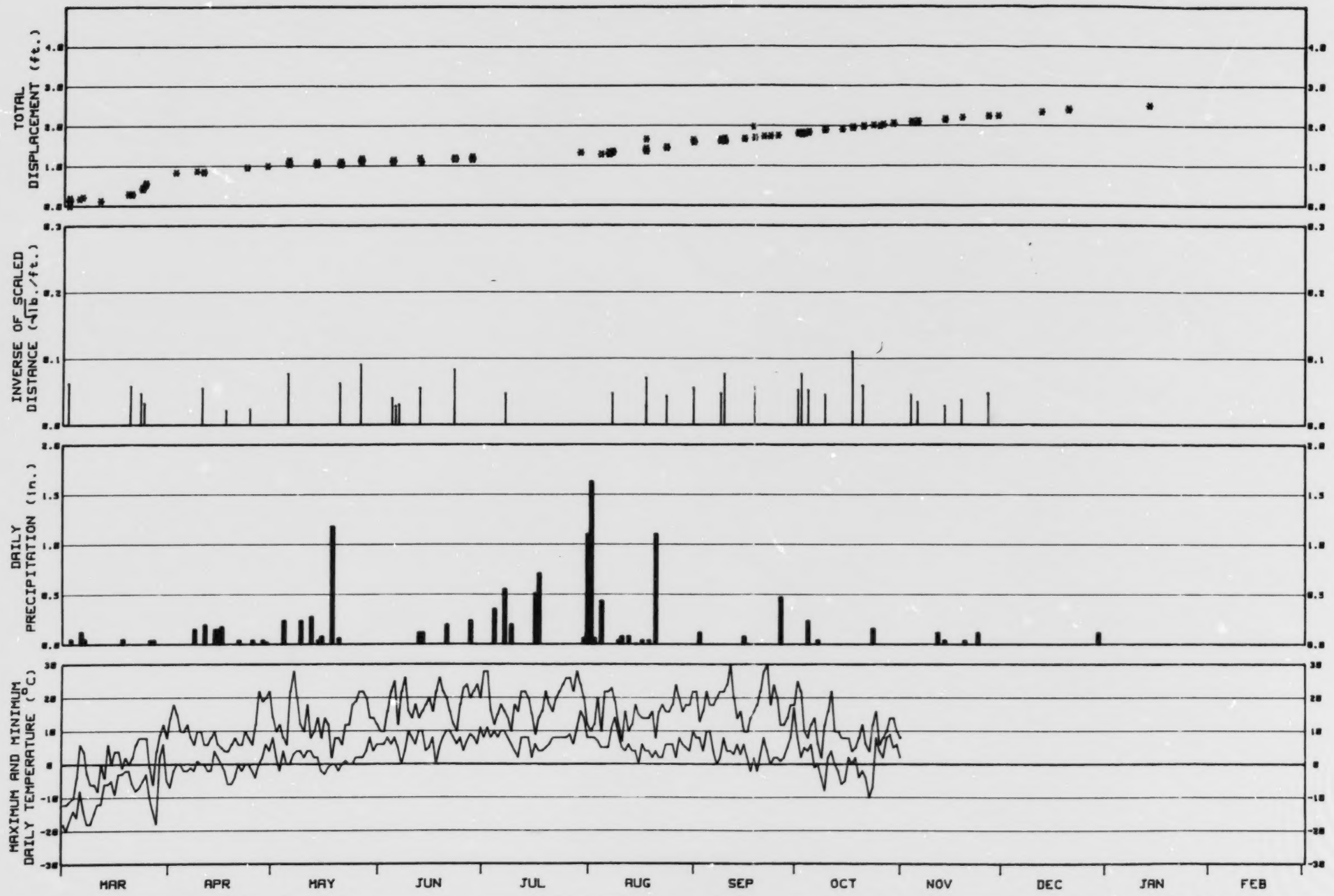
PITEAU ENGINEERING LTD.
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

GENERAL ASPECTS OF PRODUCTION BLASTING

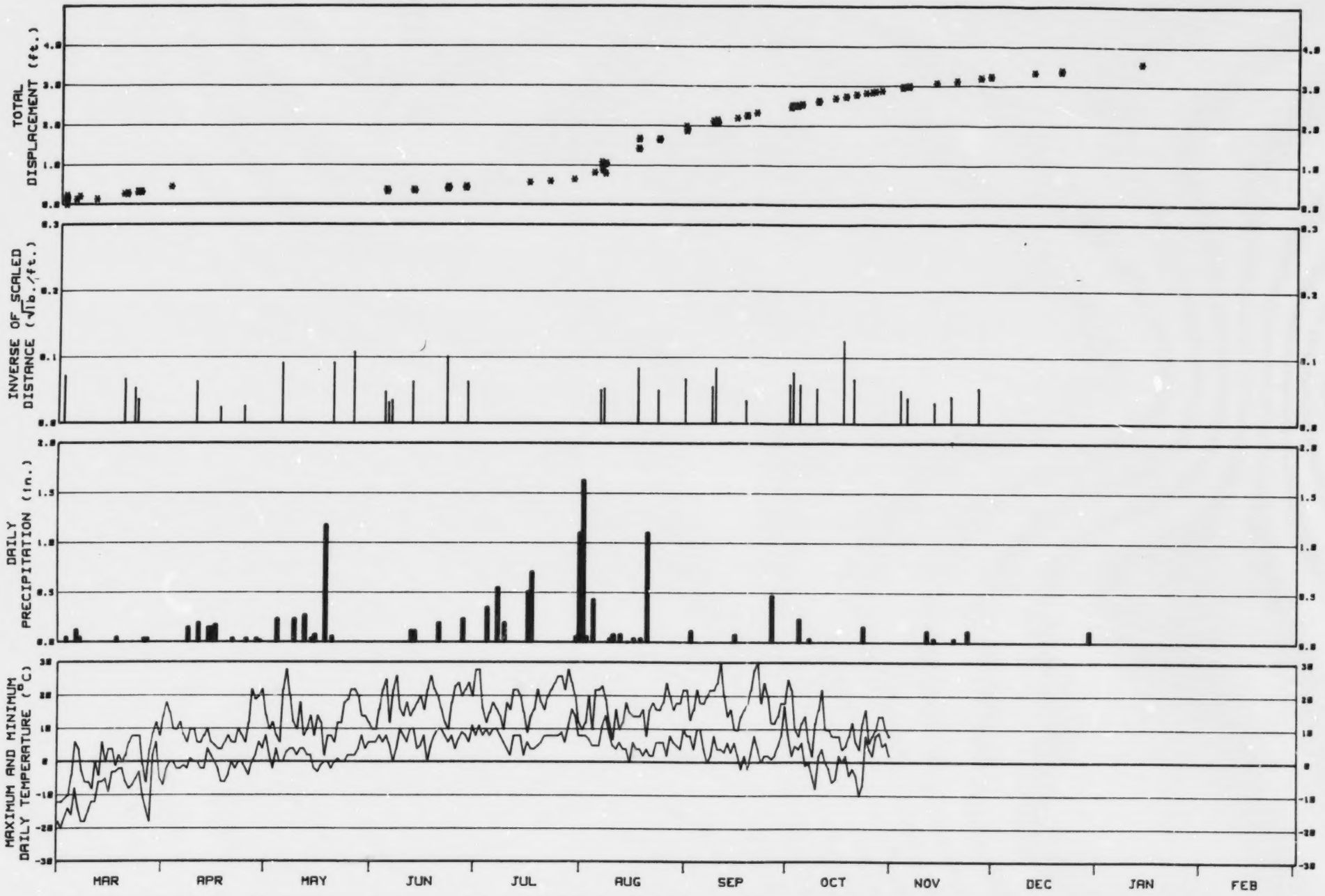
BY: MVC
DATE: JAN. 88
APPROVED:
FIGURE: 2.5



962-4 PITEAU ENGINEERING LTD.	SMOKY RIVER COAL LIMITED - CANMET	BY: M.T.D.	DATE: MAR. '88
	M-1 DUMP STABILITY	APPROVED:	FIGURE: 4.1
	ENVIRONMENTAL AND DISPLACEMENT DATA FOR PRISM 1		



962-4 PITEAU ENGINEERING LTD.	SMOKY RIVER COAL LIMITED - CANMET	BY: M.T.D.	DATE: MAR. '88
	M-1 DUMP STABILITY	APPROVED:	FIGURE: 4.2
	ENVIRONMENTAL AND DISPLACEMENT DATA FOR PRISM 2		



962-4

PITEAU ENGINEERING LTD.

SMOKY RIVER COAL LIMITED - CANMET

M-1 DUMP STABILITY

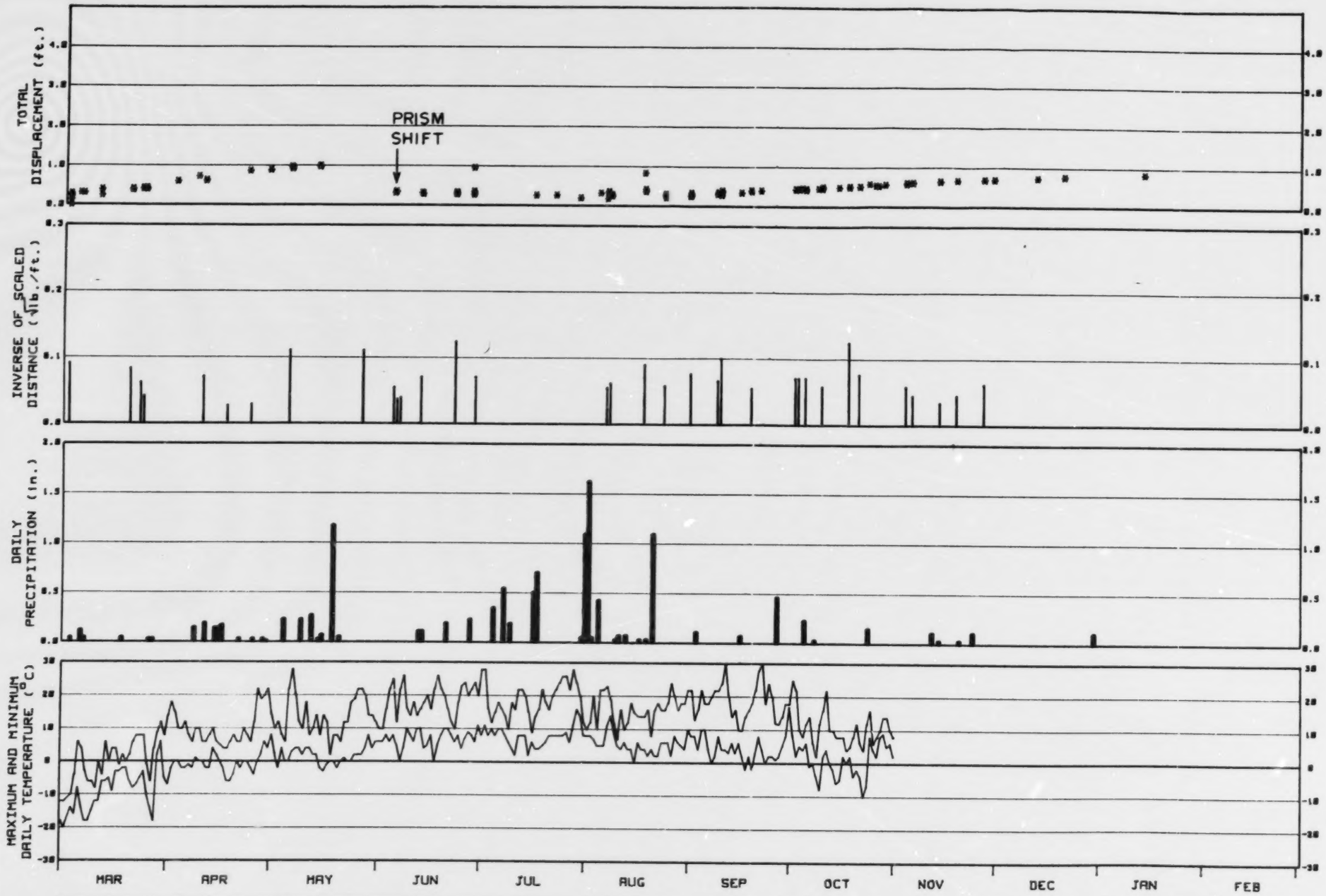
ENVIRONMENTAL AND DISPLACEMENT DATA FOR PRISM 3

BY: M.T.D.

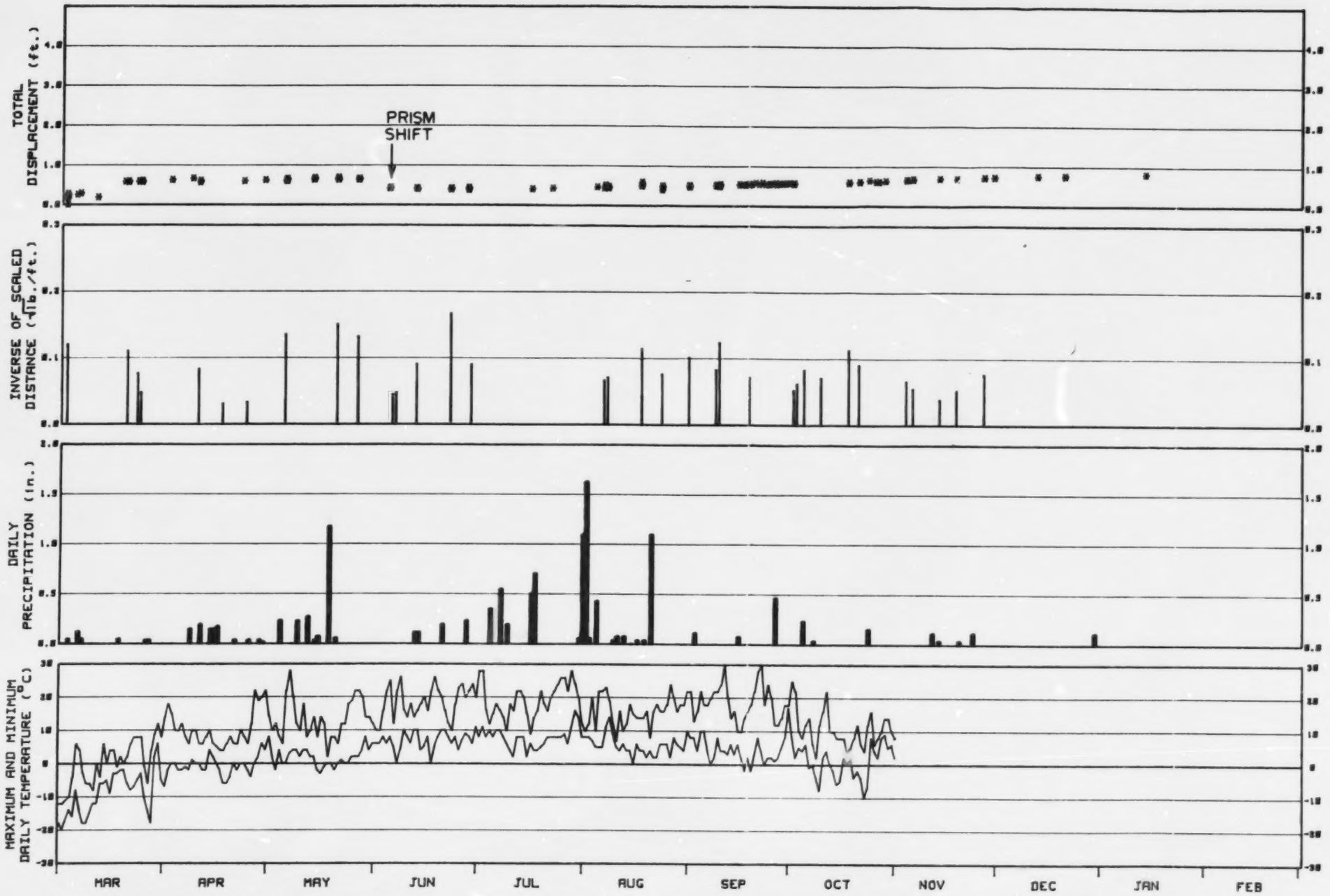
DATE: MAR. '88

APPROVED: BTF

FIGURE: 4.3



962-4 PITEAU ENGINEERING LTD.	SMOKY RIVER COAL LIMITED - CANMET	BY: M.T.D.	DATE: MAR. '88
	M-1 DUMP STABILITY ENVIRONMENTAL AND DISPLACEMENT DATA FOR PRISM 4	APPROVED: BTF	FIGURE: 4.4



962-4

PITEAU ENGINEERING LTD.

SMOKY RIVER COAL LIMITED - CANMET

M-1 DUMP STABILITY

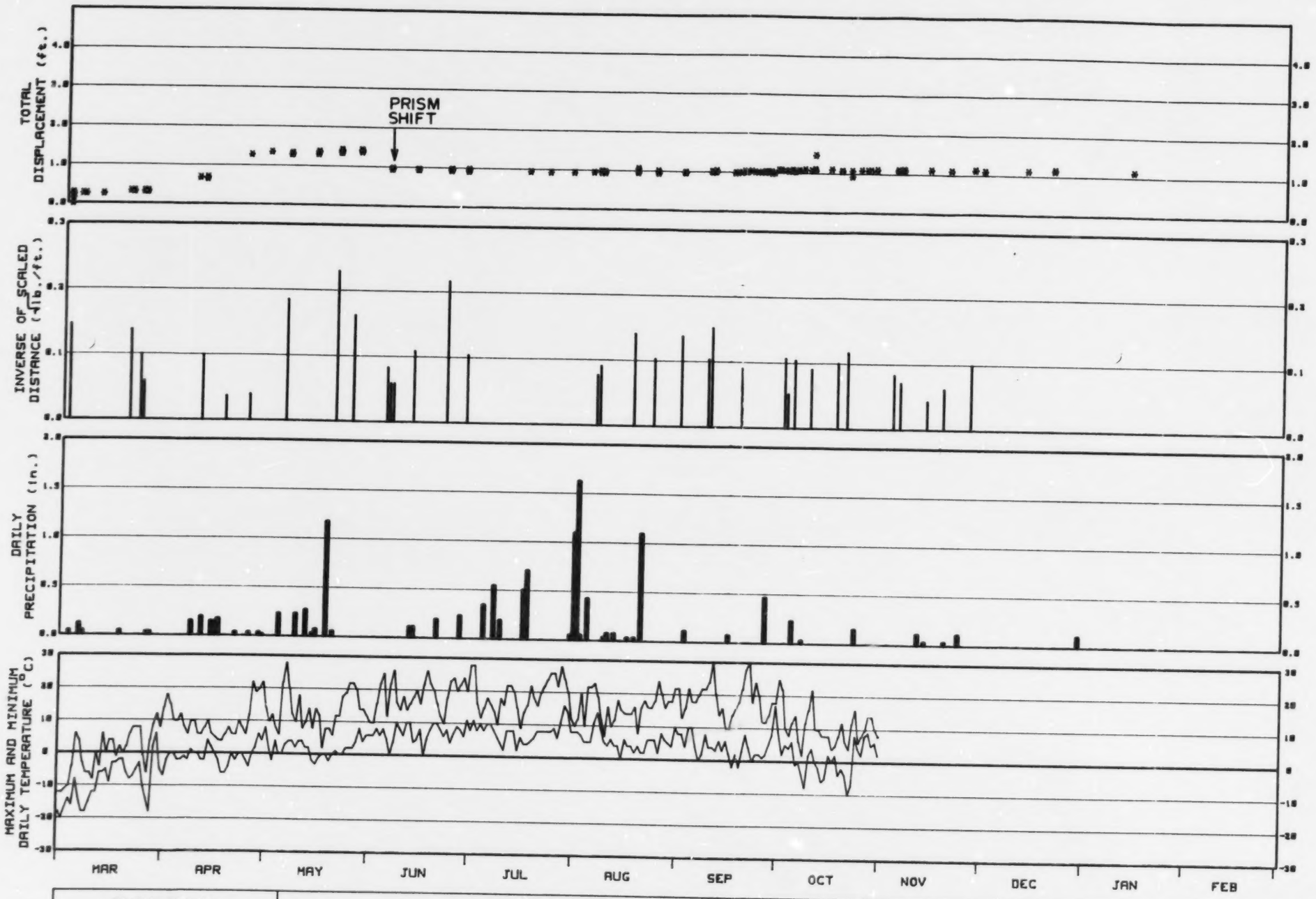
ENVIRONMENTAL AND DISPLACEMENT DATA FOR PRISM 5

BY: M.T.D.

DATE: MAR. '88

APPROVED: BH

FIGURE: 4.5



962-4

PITEAU ENGINEERING LTD.

SMOKY RIVER COAL LIMITED - CANMET

M-1 DUMP STABILITY

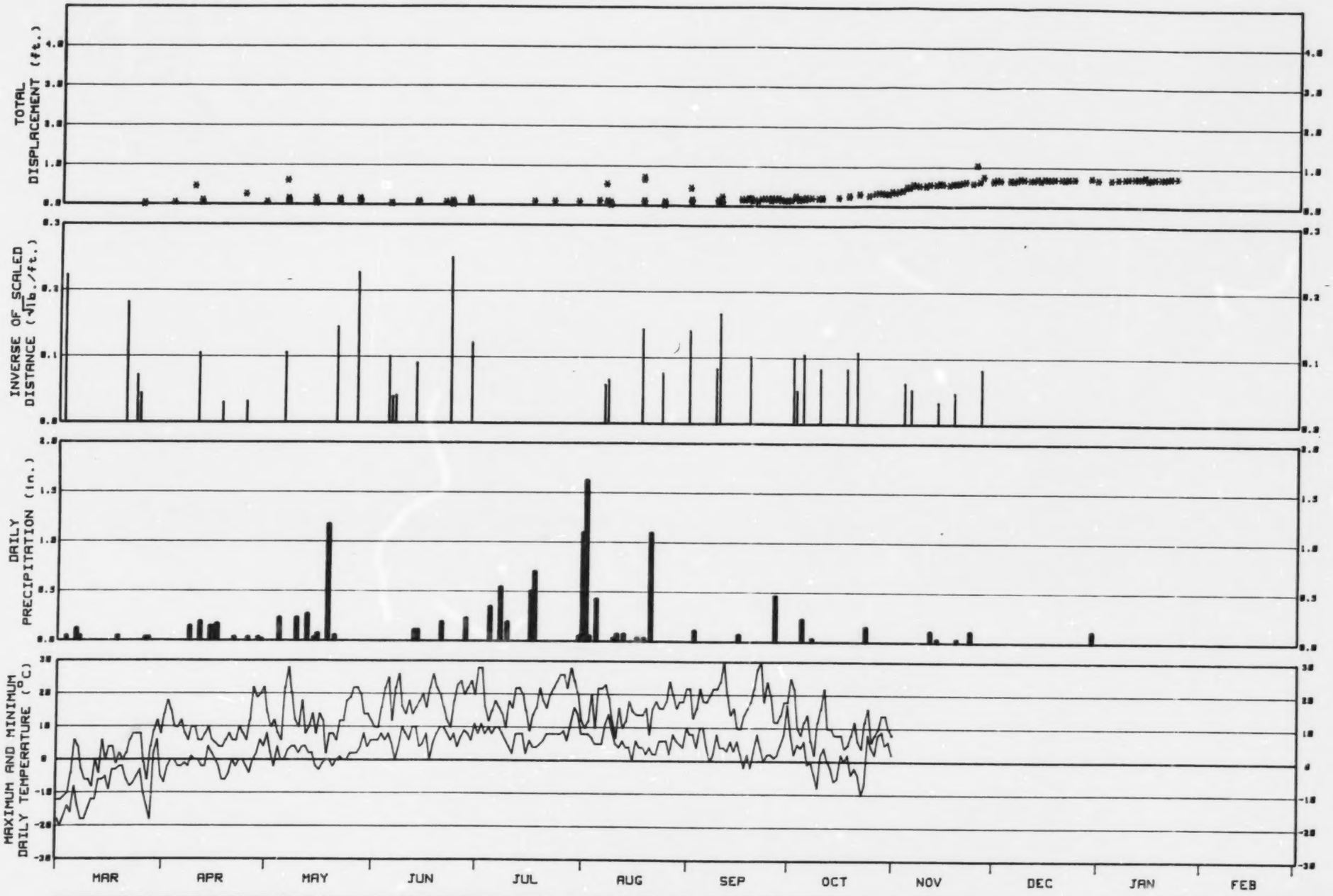
ENVIRONMENTAL AND DISPLACEMENT DATA FOR PRISM 6

BY: M.T.D.

DATE: MAR. '88

APPROVED: B

FIGURE: 4.6



962-4

PITEAU ENGINEERING LTD.

SMOKY RIVER COAL LIMITED - CANMET

M-1 DUMP STABILITY

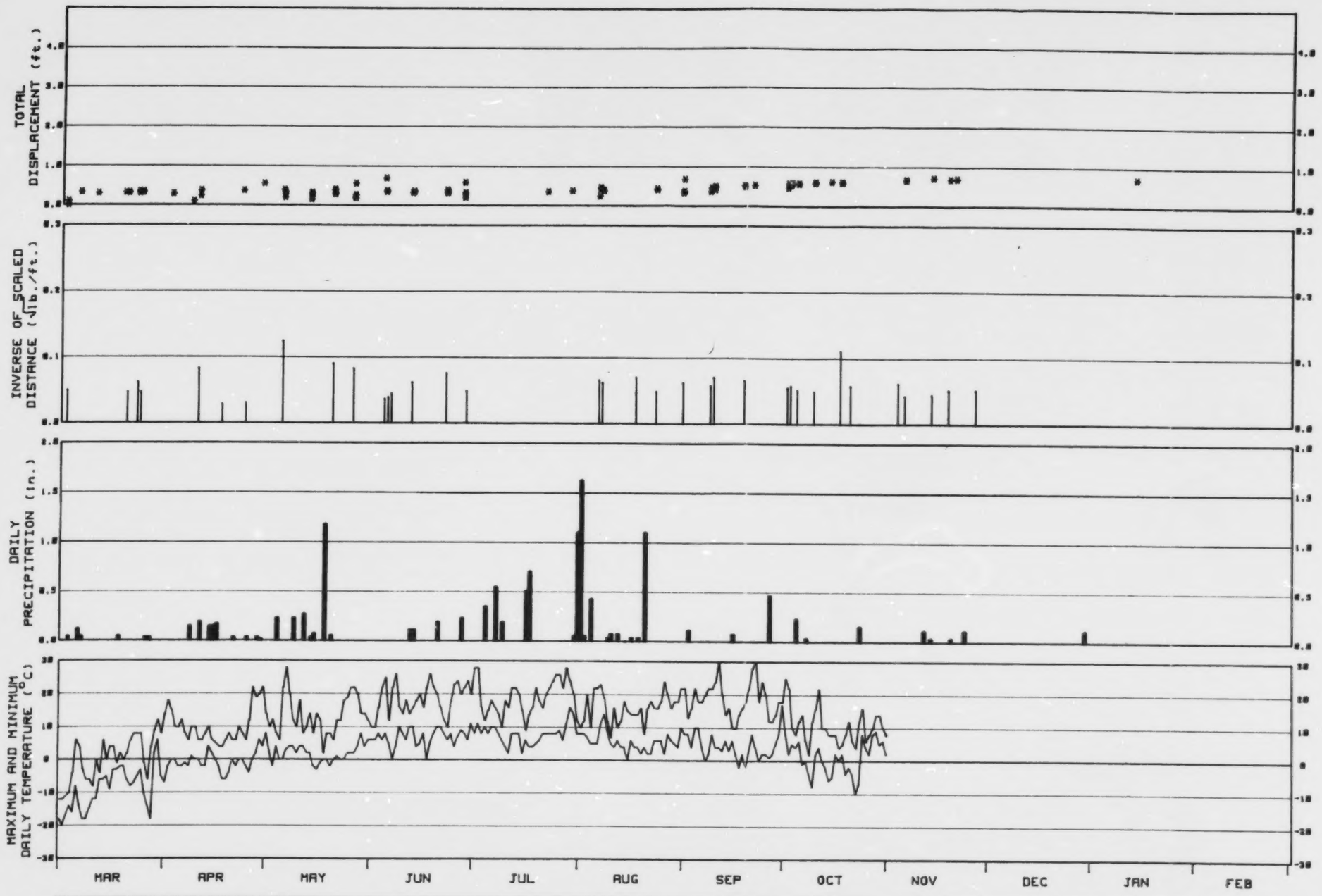
ENVIRONMENTAL AND DISPLACEMENT DATA FOR PRISM 7

BY: M.T.D.

DATE: MAR. '88

APPROVED:

FIGURE: 4.7



962-4

PITEAU ENGINEERING LTD.

SMOKY RIVER COAL LIMITED - CANMET

M-1 DUMP STABILITY

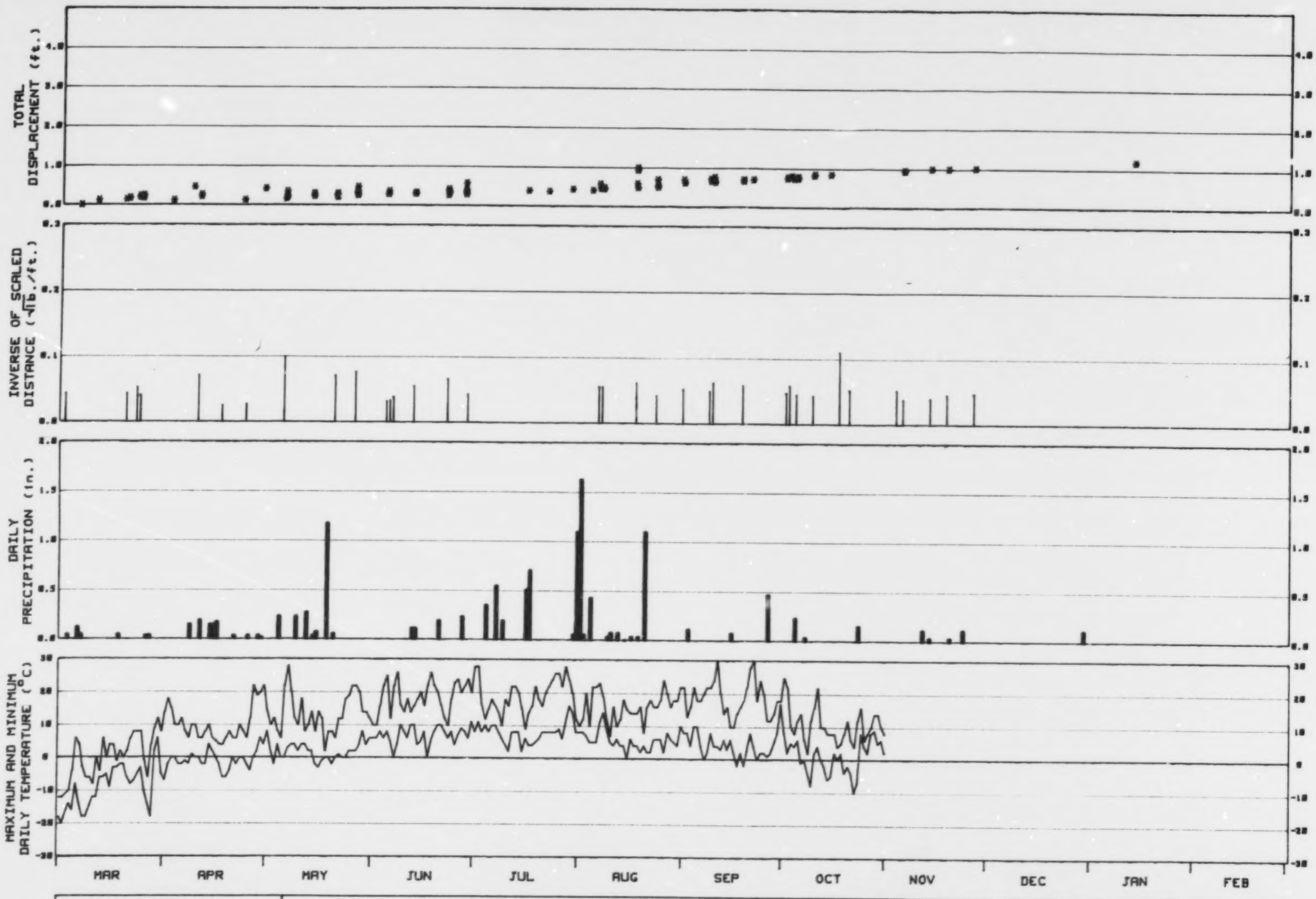
ENVIRONMENTAL AND DISPLACEMENT DATA FOR PRISM 8

BY: M.T.D.

DATE: MAR. '88

APPROVED:

FIGURE: 4.8



962-4

PITEAU ENGINEERING LTD.

SMOKY RIVER COAL LIMITED - CANMET

M-1 DUMP STABILITY

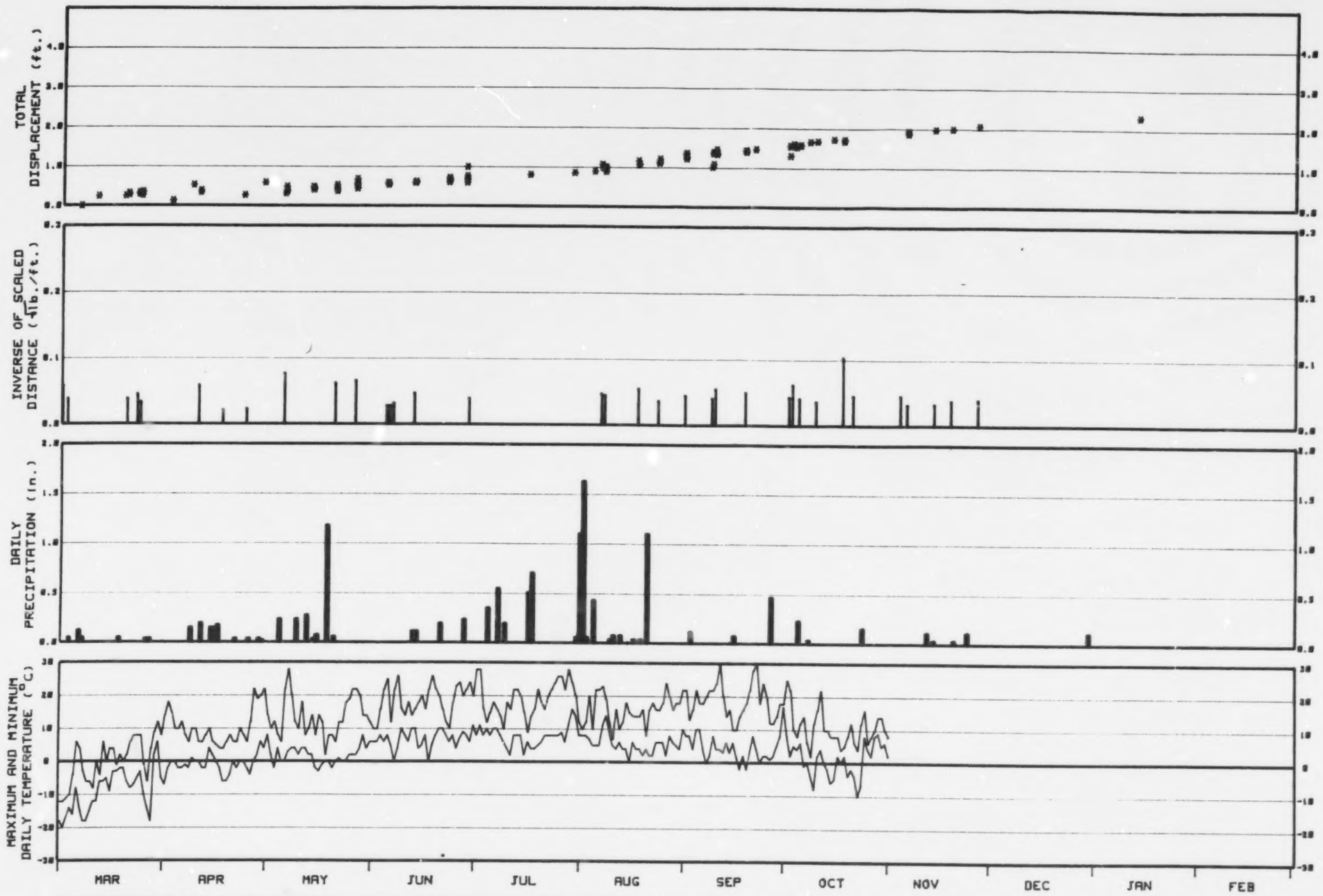
ENVIRONMENTAL AND DISPLACEMENT DATA FOR PRISM 9

BY: M.T.D.

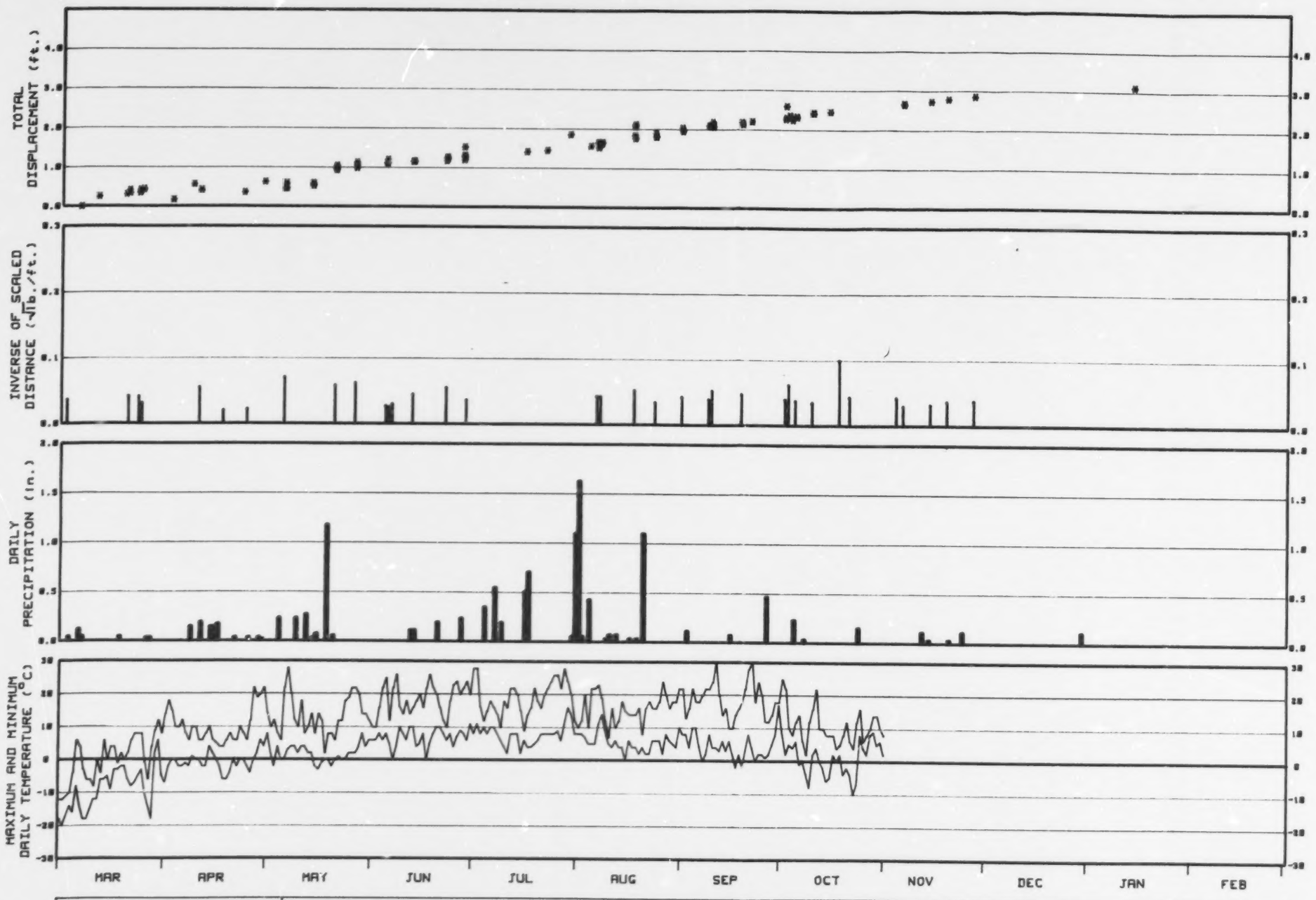
DATE: MAR. '88

APPROVED:

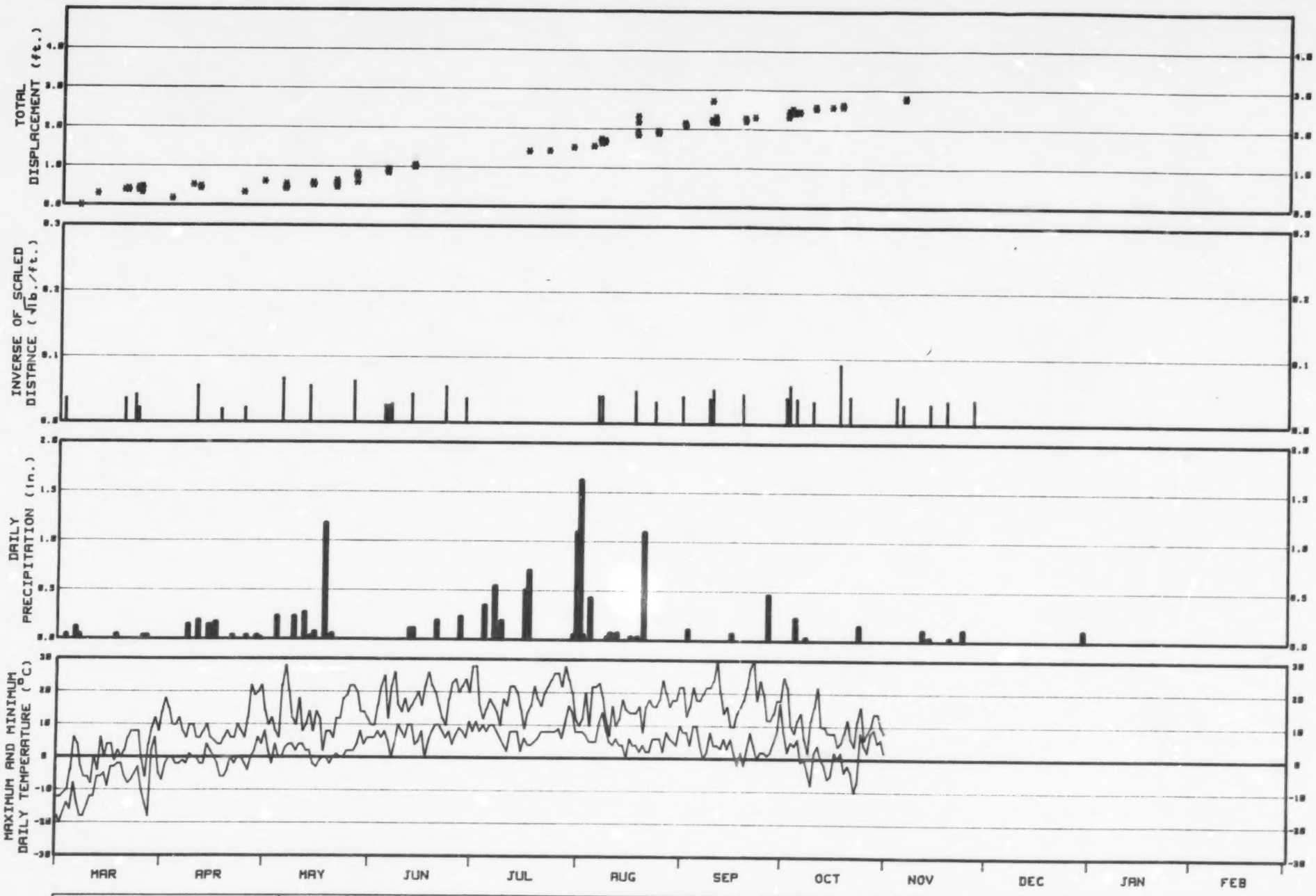
FIGURE: 4.9



962-4 PITEAU ENGINEERING LTD.	SMOKY RIVER COAL LIMITED - CANMET	BY: M.T.D.	DATE: MAR. '88
	M-1 DUMP STABILITY ENVIRONMENTAL AND DISPLACEMENT DATA FOR PRISM 10	APPROVED:	FIGURE: 4.10



962-4 PITEAU ENGINEERING LTD.	SMOKY RIVER COAL LIMITED - CANMET	BY: M.T.D.	DATE: MAR. '88
	M-1 DUMP STABILITY	APPROVED: BJF	FIGURE: 4.11
	ENVIRONMENTAL AND DISPLACEMENT DATA FOR PRISM 11		



962-4

PITEAU ENGINEERING LTD.

SMOKY RIVER COAL LIMITED - CANMET

M-1 DUMP STABILITY

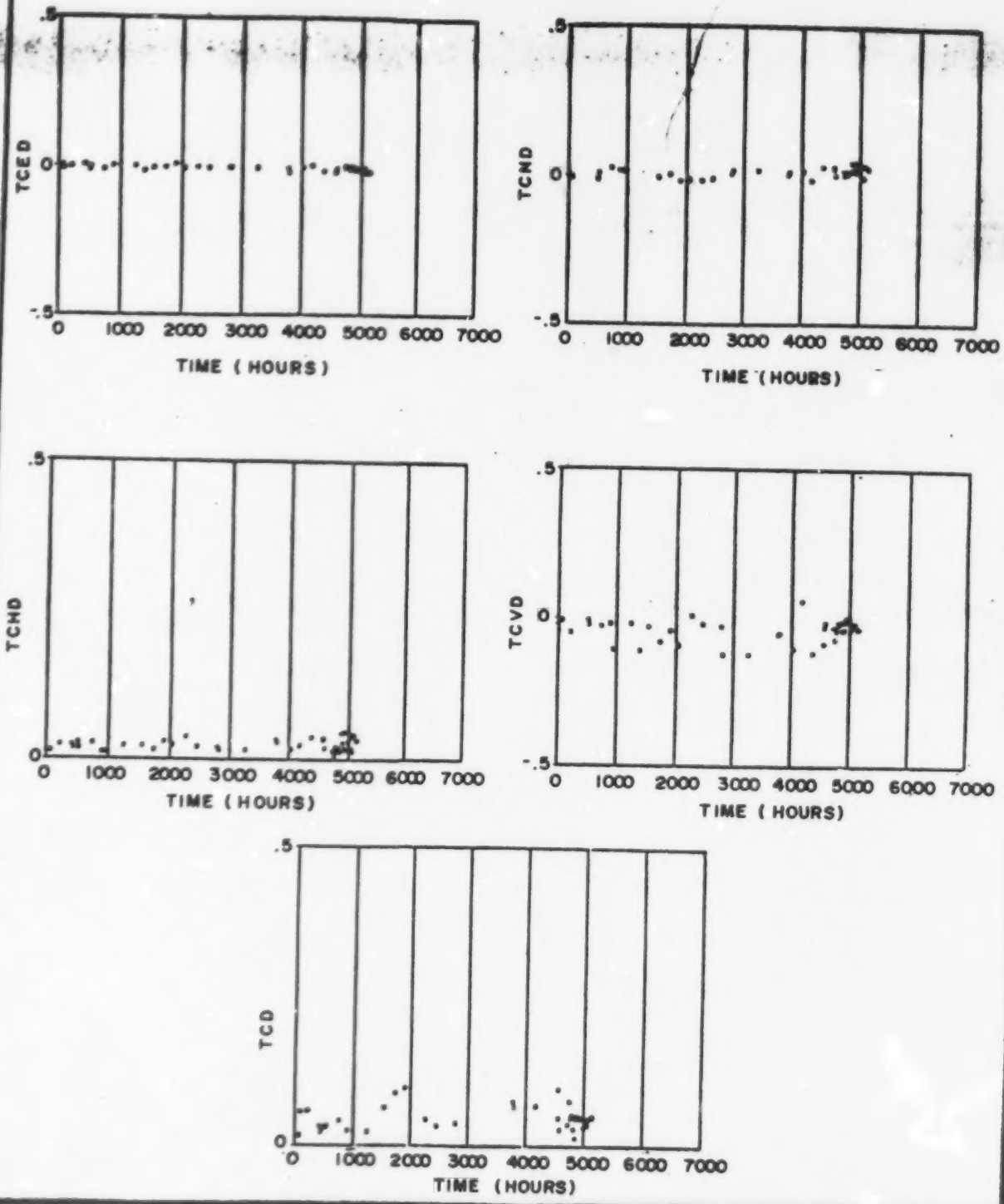
ENVIRONMENTAL AND DISPLACEMENT DATA FOR PRISM 12

BY: M.T.D.

DATE: MAR. '88

APPROVED: BTT

FIGURE: 4.12

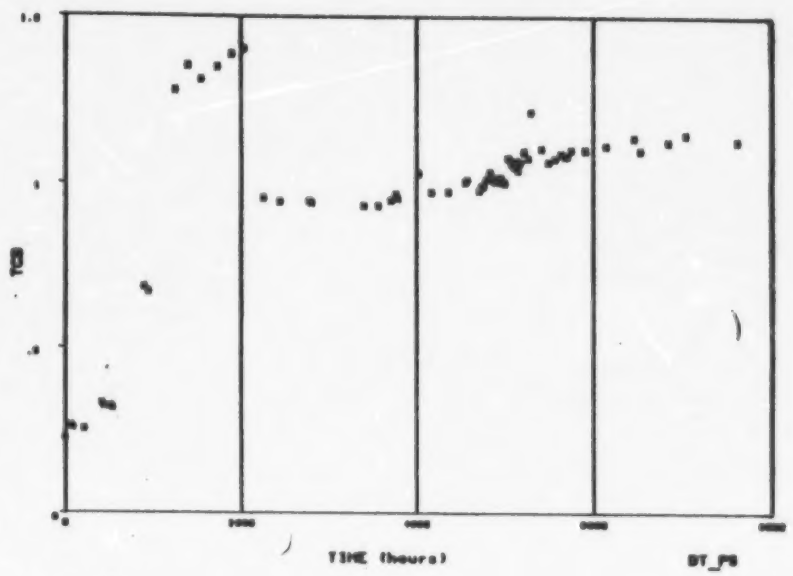


SMOKY RIVER COAL LIMITED - CANMET
DYNAMIC STABILITY OF M-1 DUMP

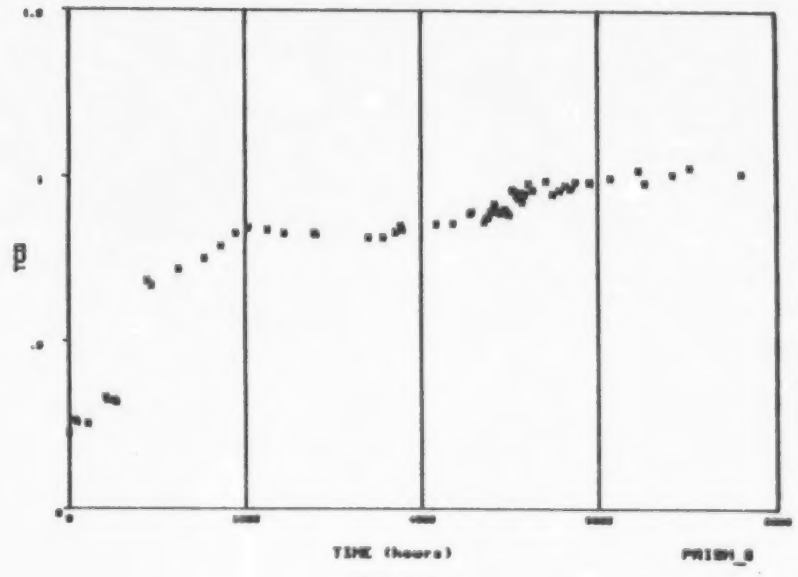
PITEAU ENGINEERING LTD.
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

PRISM 1-DISPLACEMENT DATA

BY:	DATE:
M.T.	NOV. / 88
APPROVED:	FIGURE:
BH	4.13



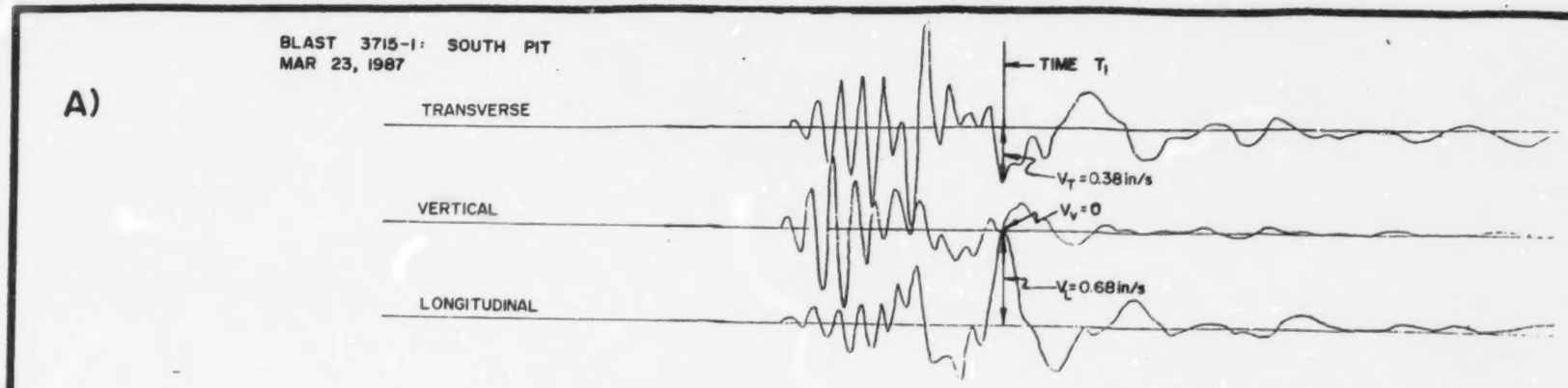
PRE



POST

SMOKY RIVER COAL LIMITED - CANMET DYNAMIC STABILITY OF M-1 DUMP	PITEAU ENGINEERING LTD. GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS VANCOUVER CALGARY	
TYPICAL PRE AND POST AMENDED DATA	BY: M.T.	DATE: NOV./88
	APPROVED:	FIGURE: 4.14

A)



EXAMPLE CALCULATION OF PEAK VECTOR SUM FOR RECORD A

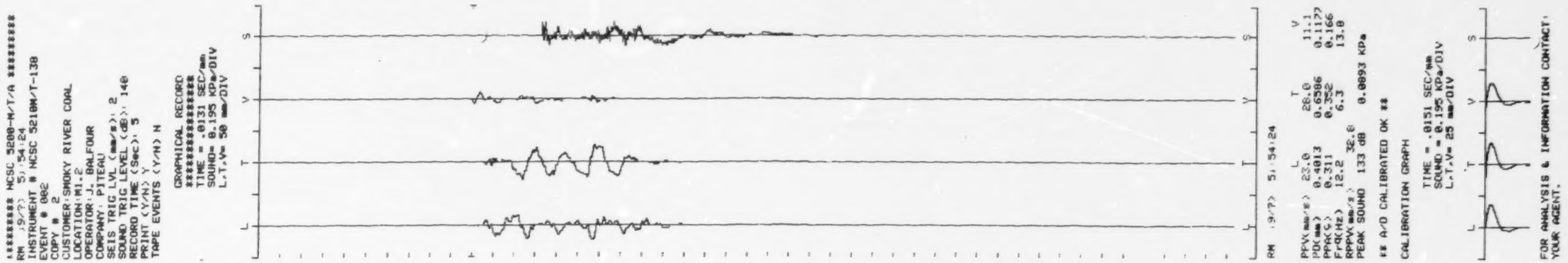
$$PVS = \sqrt{V_T^2 + V_V^2 + V_L^2}$$

WHERE V_T, V_V AND V_L ARE TRANSVERSE, VERTICAL AND LONGITUDINAL COMPONENTS OF PARTICLE VELOCITY

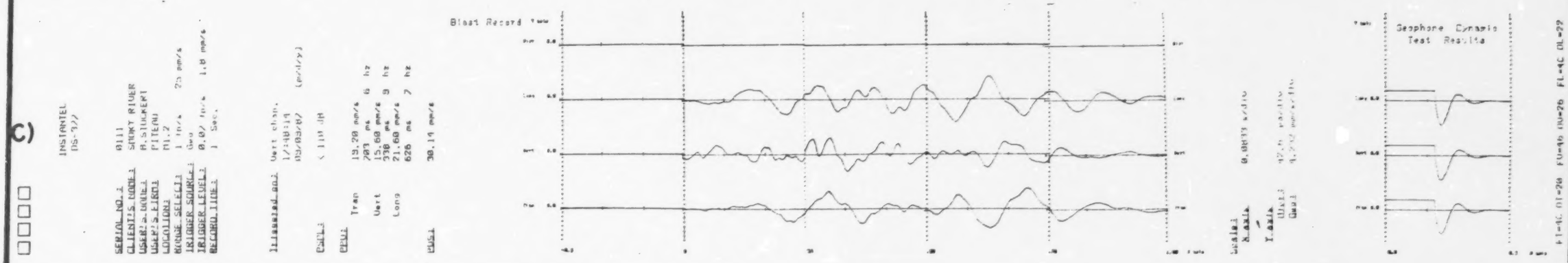
AT TIME T_1:

$$PVS = \sqrt{(0.38)^2 + 0^2 + (0.68)^2} = 0.78 \text{ in/s}$$

B)



C)



NOTES:
1) RECORD A) IS FROM A SPRENGNETHER VS1200 ANALOGUE SEISMOGRAPH. RECORD IS PRODUCED ON LIGHT-SENSITIVE FILM.
2) RECORD B) IS FROM A NOMIS NCSC 5200 DIGITAL SEISMOGRAPH. NOTE THAT 3 AND POSSIBLY 4 DISTINCT DELAYS CAN BE DISTINGUISHED.
3) RECORD C) IS FROM INSTANTEL DS-377 DIGITAL SEISMOGRAPH.

SMOKY RIVER COAL LIMITED
DYNAMIC STABILITY OF
M-1 DUMP

PITEAU ENGINEERING LTD.
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

EXAMPLES OF PARTICLE VELOCITY RECORDS

BY: Z. SLEDZ
DATE: OCT. 87
APPROVED:
FIGURE: 4.15

5. DATA ANALYSIS - DYNAMICS

5.1 SITE SPECIFIC VIBRATION ATTENUATION

A total of 25 vibration records were collected throughout the study period. Pertinent data on charge weights and blast coordinates are provided in Appendix II and vibration data are summarized in Table 5.1.

A graph showing peak particle velocity (true vector sum) versus square root scaled distance is shown on Figure 5.1. A least squares fit through the data results in the relation:

$$V = 3.5\ (D/W^{1/2})^{-0.714}$$

where V = peak particle velocity (in/s)
W = maximum charge weight per delay period
D = distance from centre of blast to point considered.

Also shown on Figure 5.1 is a least squares regression line for data from surface coal mines in the United States (after Dowding, 1985). This regression is based on 426 points and is representative of conditions in the coal measures of the interior plains (Dowding, personal communication, 1988).

The least squares relation for U.S. coal mines is in good agreement with upper bound data from the M-1 dump. Therefore, there appears to be more attenuation of blasting vibrations at the No. 9 mine South Pit compared with interior plains coal mines.

Peak particle velocities for transducer locations on the dump and on native overburden or bedrock are plotted on Figure 5.1 with different symbols. An examination of the data leads to the conclusion that dump thickness does not have a significant effect on attenuation in relation to other variables described in Section 2.3.

5.2 EFFECTIVE CHARGE WEIGHT

A total of 5 blasts, each measured with two vibration monitors, were analyzed in detail to determine the appropriate effective charge weight to develop a more refined site-specific scaling relationship. Details regarding charge weight for individual delays, delay patterns and detonation patterns were generated and are shown in Figures 5.2 through 5.6. Vibration response data for these blasts are presented in Appendix IV.

The data were analyzed to determine if the observed peak particle velocities tended to correlate directly with the maximum weight per delay, or if there tended to be any cumulative effects of successive delays. The data tend to imply that the peak particle velocity is more strongly dependent on the average weight of charge per delay, as opposed to the maximum. This is illustrated by assessing Blast No. 3715-5, 3625-5 and 3625-6 (Appendix IV), where it is observed that the peak velocities of individual cycles are reasonably constant, although charge weights per delay varied from 3819 lbs to 7850 lbs, 1975 lbs to 5800 lbs, and 3860 lbs to 5425 lbs, respectively. In general, the maximum particle velocity did not appear to be directly correlatable with the maximum delay. Due to the use of 50 millisecond delays, combined with the blasting pattern and in situ compression wave velocity, there appears to be negligible cumulative effects of successive delays. It is therefore considered appropriate, for developing the site specific attenuation

relationship for the South Pit, to use the average weight per delay as the effective charge weight. This will have the tendency to increase the scaled distance for a given blast over that determined using the maximum charge weight per delay.

A refined site-specific scaling relationship was generated utilizing the data from the aforementioned 5 blasts. The data are shown plotted in Figure 5.7, along with the least squares, best fit line and associated equation for the line.

5.3 PREDICTION OF DYNAMIC DUMP RESPONSE

This section provides a brief review of the method initially used to assess the dynamic stability of the M-1 Dump, and predicted blast induced behaviour. The method was developed to provide conservative estimates of potential deleterious effects of blasting on dump deformation response as part of the permitting procedure required prior to mining below the dump.

For the dump to fail as a result of anticipated levels of blast induced dynamic loading, it was assumed that significant excess pore water pressure would have to develop within the dump. Although the majority of the dump contains competent, free-draining sandstone and siltstone material, it can be seen in exposures and has been confirmed by mine personnel that extensive coaly waste, mudstone and shale waste rock was placed in the M-1 Dump. These rock types can quickly degrade into fine grained material with low hydraulic conductivity. Therefore, it was considered possible for isolated pockets of saturated material to be present within the dump. This saturated material could be subject to strength reductions as a result of excess pore pressure build up induced by blasting vibrations.

The analytical approach involved two basic components:

- o estimate of blasting induced strains and stresses; and,
- o estimate of pore pressure response to induced stresses.

In the absence of site-specific vibration attenuation data, strains were originally estimated using the following relationships:

$$V_p = 121.1\ (D/W^{1/2})^{-1.67} \qquad \text{Eq. 1}$$

(Duvall et al, 1967)

$$E_{long} = V_p/V_c \times 100 \qquad \text{Eq. 2}$$

(Stagg and Zienkiewicz, 1968)

Where V_p = peak particle velocity (in/sec)
D = distance of blasting from slope (ft)
W = effective weight of charge (lb)
E_{long} = induced longitudinal strain (%)
V_c = compression wave velocity (ft/sec)

For the present study, actual particle velocities were measured on the surface of the dump. In addition to providing a refined site specific attenuation relationship, as discussed in Section 5.2, these data were used directly to estimate blast-induced strains. The best-fit site specific relationship describing blast energy attenuation is:

$$V_p = 8.2\ (D/W\ 1/2)^{-.94}$$

Note that for blasting conditions at the South Pit, this relationship will predict peak particle velocities, and corresponding strains, up to five times lower than those predicted using the Duvall (1967) relationship. This implies conservatism in the original study predictions, as was the intent.

Upon estimating induced strains, assuming those strains are associated with the initial compression wave (1/4 cycle), the induced cyclic shear stress ratio was evaluated using Figure 5.8. Material response was inferred from data in the literature, due to lack of cyclic test data for the M-1 Dump material.

The induced stress was assumed to be sinusoidal, a standard assumption for cyclic response analysis. The following relationship (Seed et al, 1976) was then used to estimate induced excess pore pressure:

$$\frac{\Delta u}{\sigma_v'} = \frac{1}{2} + \frac{1}{\pi} \sin^{-1}\left[2\left(\frac{N}{N_e}\right)^{\theta} - 1\right] \qquad \text{Eq. 3}$$

Where Δu = excess pore pressure
σ_v' = effective vertical stress
N = number of induced cycles
Ne = number of cycles to cause liquefaction

The number of cycles to cause liquefaction under the induced cyclic shear stress ratio was estimated from a laboratory liquefaction resistance curve assuming the response of similar material would adequately describe the behaviour of the M-1 dump material. (Oroville Dam, Figure 5.9).

The original analysis assumed a worst case condition that the entire charge weight could act in unison, negating the effects of individual delays. A review of the response data indicates that the total charge weight does not act in unison and the response is more representative of a number of cycles of loading under lower levels of cyclic shear stress. Implementation of the above procedure utilizing the site specific attenuation relationship, typical scaled distances, and cyclic response data

from the literature predicts negligible excess pore pressure response. Application of Newmark's method to predict blast induced plastic displacements indicates negligible plastic displacements. This would imply negligible blasting effects, as was observed and is discussed in Section 6.

It should be noted that the original study assumed the potential presence of saturated material in the dump. Although one standpipe piezometer was installed within the toe of the dump, installation of more piezometers higher on the dump was evaluated and deemed impractical for the present study due to very difficult access, drilling difficulties in the coarse-grained dump material and the potential for isolated pockets of saturated material requiring a trial-and-error approach to the drilling program. Therefore, corroboration of predicted negligible excess pore pressure generation is not possible. Observations of negligible blasting effects on dump deformation behaviour could either be due to a lack of saturated material or to negligible pore pressure generation as predicted.

TABLE 5.1

VIBRATION MONITORING DATA FOR SOUTH PIT M-1 DUMP

DATE (BLAST NO.)	GEOPHONE COORDINATES (Northing, Easting, Elevation)	SLOPE DISTANCE FROM BLAST TO GEOPHONE (ft)	PARTICLE VELOCITIES (in/s)				SCALED DISTANCE ft/$\sqrt{lbs}$
			Transverse	Vertical	Longitudinal	Peak True Vector Sum	
March 2 (4000-1)	47425 N 98150 E 4151	410	2.01	5.66	1.57	5.84	5.8
March 23 (3715-1)	47187 N 98158 E 4079	1,056	0.75	0.55	0.67	0.76	11.7
May 5 (3670-2)	47030 N 98980 E 3690	740				0.21	6.0
May 26 (3895-2) (3895-2)	27030 N 98300 E 3972	380				3.26	3.2
June 4 (3850-3)	47187 N 98158 E 4079	450	-	-	-	0.86	7.6
June 12 (3625-1)	47030 N 98300 E 3972	750	0.20	0.20	0.40	0.42	7.0
Sept. 8 (3715-5)		720 1,000	0.20 0.76	0.52 0.61	0.35 0.85	0.56 1.31	8.1 11.3

TABLE 5.1 (Cont'd)

VIBRATION MONITORING DATA FOR SOUTH PIT M-1 DUMP

DATE (BLAST NO.)	GEOPHONE COORDINATES (Northing, Easting, Elevation)	SLOPE DISTANCE FROM BLAST TO GEOPHONE (ft)	PARTICLE VELOCITIES (in/s)				SCALED DISTANCE ft/$\sqrt{lbs}$
			Transverse	Vertical	Longitudinal	Peak True Vector Sum	
Sept. 9 (3760-4)	47187 N 98158 E 4079	880 600	0.76 0.33	0.61 0.52	0.85 0.43	1.19 0.76	7.2 5.0
Sept. 18 (3715-6) (3715-7) (3715-8)	Simultaneous 47170 N 98482 E 3955	620	0.65	0.86	0.91	1.11	8.6
Oct. 1 (3715-0)	47170 N 98482 E 3955	730	0.29	0.65	0.21	0.66	7.8
Oct. 2 (3715-10)	47170 N 98482 E 3955	1,480	0.50	0.61	0.51	0.78	20.1
Oct. 4 (3715-11)	47170 N 98482 E 3955	730	0.39	0.58	0.39	0.63	8.0
Oct. 9 (3670-6)	47420 N 98414 E 4093	1,040	0.17	0.16	0.20	0.25	12.4

TABLE 5.1 (Con't.)

VIBRATION MONITORING DATA FOR SOUTH PIT M-1 DUMP

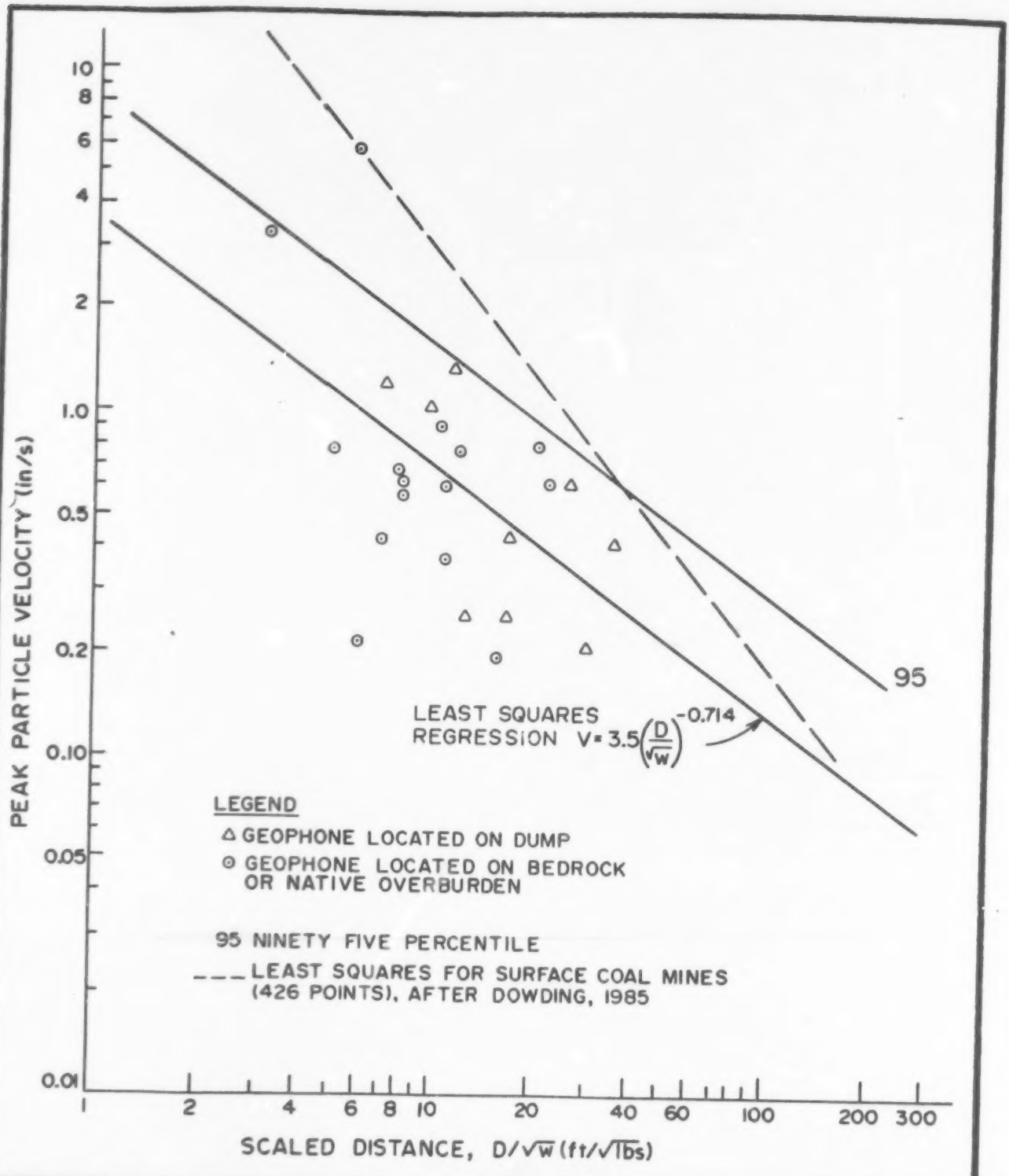
DATE (BLAST NO.)	GEOPHONE COORDINATES (Northing, Easting, Elevation)	SLOPE DISTANCE FROM BLAST TO GEOPHONE (ft)	PARTICLE VELOCITIES (in/s)				SCALED DISTANCE ft/$\sqrt{lbs}$
			Transverse	Vertical	Longitudinal	Peak True Vector Sum	
Oct. 17 (3580-1)	47170 N 98482 E 3955	1,220	0.35	0.31	0.20	0.37	10.9
Oct. 20 (3670-10)	47420 N 98414 E 4093	980	0.93	0.43	0.65	1.01	9.6
Nov. 3 (3580-2)	47170 N 98482 E 3955	1,060	0.56	0.61	0.33	0.70	10.9
Nov. 5 (3625-5)	47420 N 98414 E 4093	1,140	0.08	0.25	0.11	0.25	16.8
	48120 N 98172 E 4525	1,990	0.17	0.08	0.16	0.20	29.3
Nov. 13 (3580-3)	47170 N 98482 E 4525	1,630	0.37	0.50	0.17	0.62	22.4
	48120 N 98172 E 4525	2,580	0.36	0.16	0.24	0.41	35.4

TABLE 5.1 (Con't.)

VIBRATION MONITORING DATA FOR SOUTH PIT M-1 DUMP

DATE (BLAST NO.)	GEOPHONE COORDINATES (Northing, Easting, Elevation)	SLOPE DISTANCE FROM BLAST TO GEOPHONE (ft)	PARTICLE VELOCITIES (in/s)				SCALED DISTANCE ft/$\sqrt{lbs}$
			Transverse	Vertical	Longitudinal	Peak True Vector Sum	
Nov. 18 (3580-4)	47170 N 98482 E 3955	1,330	0.12	0.18	0.08	0.19	15.3
	48120 N 98172 E 4525	2,400	0.20	-	0.28	-	27.7
Nov. 26 (3625-6)	47170 N 98482 E 3955	760	0.57	0.51	0.71	0.90	8.9
	48120 N 98172 E 4525	1,890	0.47	0.16	0.77	0.61	22.1
Dec. 12 (3535-2)	47420 N 98414 E 4093	1,320	0.24	0.22	0.41	0.43	17.2

962-4



SMOKY RIVER COAL LIMITED - CANMET
DYNAMIC STABILITY OF
M-1 DUMP

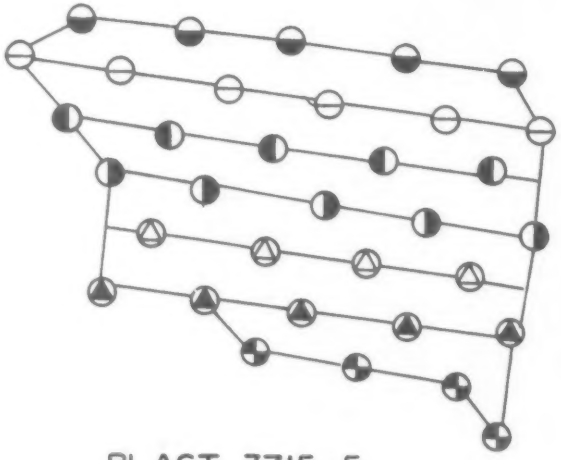
PITEAU ENGINEERING LTD.
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

PEAK PARTICLE VELOCITY (TRUE VECTOR SUM) VS SQUARE ROOT SCALED DISTANCE

BY:	DATE:
MVC	JAN. 88
APPROVED:	FIGURE:
BF	5.1

ROW		lbs	ANFO
1	0	5025	3819
2	50 MS	10 330	7850
3	100 MS	9000	6928
4	150 MS	7755	6455
5	200 MS	4915	4825
6	250 MS	6640	6528
7	300 MS	6270	6158
	TOTAL	49935	42 563

Note: As some production blasts utilized gelatine slurry, charge weights have been converted to equivalent weight of ANFO.



BLAST 3715-5
SEPT. 8, 1987

SMOKY RIVER COAL LIMITED - CANMET
DYNAMIC STABILITY OF M-1 DUMP

PITEAU ENGINEERING LTD.
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

PATTERN FOR BLAST NUMBER 3715-5

BY:

DATE:

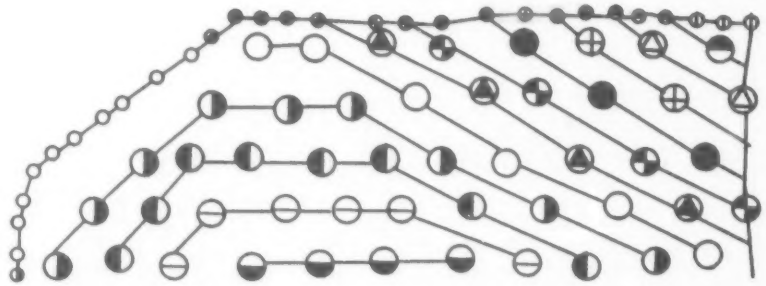
APPROVED:

FIGURE: 5.2

962-4

ROW		lbs	ANFO
1	0	4100	3380
2	50 MS	4250	3500
3	100 MS	4720	3890
4	150 MS	19215	14830
5	220 MS	7395	7196
6	250 MS	7150	5925
7	300 MS	8565	6580
8	350 MS	6370	4894
9	400 MS	4520	4435
10	450 MS	4525	3474
11	500 MS	2505	1922
12	550 MS	600	456
	TOTAL	73 915	60 482

Note: As some production blasts utilized gelatine slurry, charge weights have been converted to equivalent weight of ANFO.



BLAST 3760-4
Sept. 9, 1987

SMOKY RIVER COAL LIMITED - CANMET
DYNAMIC STABILITY OF M-1 DUMP

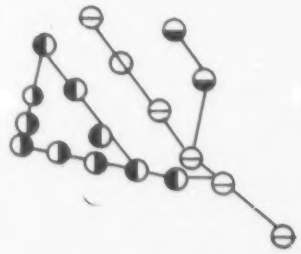
PITEAU ENGINEERING LTD.
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

PATTERN FOR BLAST NUMBER 3760-4

BY: MVC
DATE: FEB. 88
APPROVED:
FIGURE: 5.3

ROW		lbs	ANFO
1	0	2380	1975
2	50 MS	6745	5800
3	100 MS	6025	5000
4	150 MS	2985	2597
	TOTAL	18135	15372

Note: As some production blasts utilized gelatine slurry, charge weights have been converted to equivalent weight of ANFO.



BLAST 3625-5
NOV. 5, 1987

SMOKY RIVER COAL LIMITED - CANMET
DYNAMIC STABILITY OF M-I DUMP

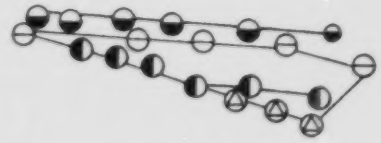
PITEAU ENGINEERING LTD.
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

PATTERN FOR BLAST NUMBER 3625-5

BY: MVC
DATE: FEB. 88
APPROVED:
FIGURE: 5.4

ROW		lbs	ANFO
1	0	5180	4455
2	50 MS	6400	5312
3	100 MS	5595	4644
4	150 MS	750	455
	TOTAL	17925	14 866

Note: As some production blasts utilized gelatine slurry, charge weights have been converted to equivalent weight of ANFO.



BLAST 3580-3

NOV. 13, 1987

SMOKY RIVER COAL LIMITED - CANMET
DYNAMIC STABILITY OF M-1 DUMP

PITEAU ENGINEERING LTD.
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

PATTERN FOR BLAST NUMBER 3580-3

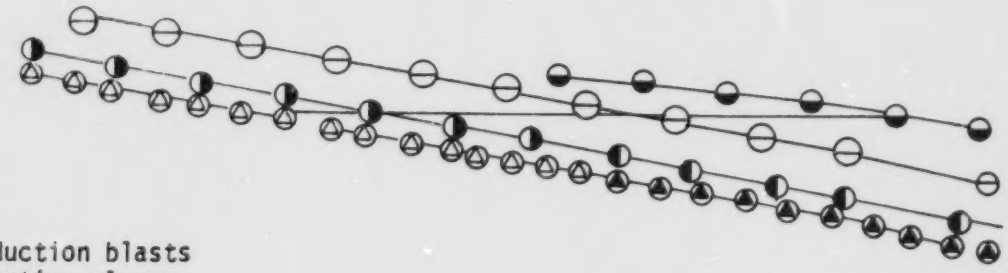
BY: MVC

DATE: FEB. 88

APPROVED:

FIGURE: 5.5

ROW		lbs	ANFO
1	0	6260	5195
2	50 MS	6260	5195
3	100 MS	6120	5080
4	150 MS	6535	5425
5	200 MS	5500	4565
6	250 MS	4650	3860
	TOTAL	35 325	29 320



Note: As some production blasts utilized gelatine slurry, charge weights have been converted to equivalent weight of ANFO.

BLAST 3625-6
NOV. 26, 1987

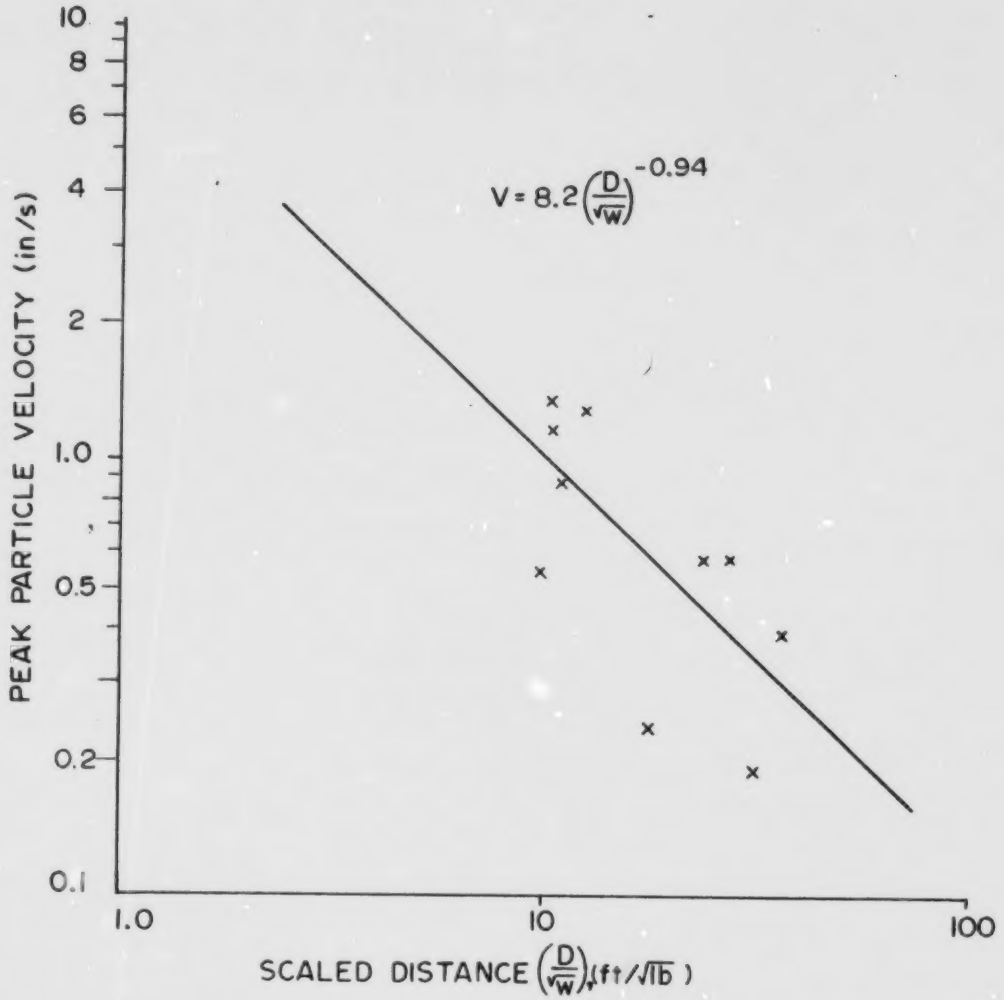
SMOKY RIVER COAL LIMITED - CANMET
DYNAMIC STABILITY OF M-1 DUMP

PITEAU ENGINEERING LTD.
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

PATTERN FOR BLAST NUMBER 3625-6

BY:	DATE:
MVC	FEB. 88
APPROVED: BH	FIGURE: 5.6

962-4



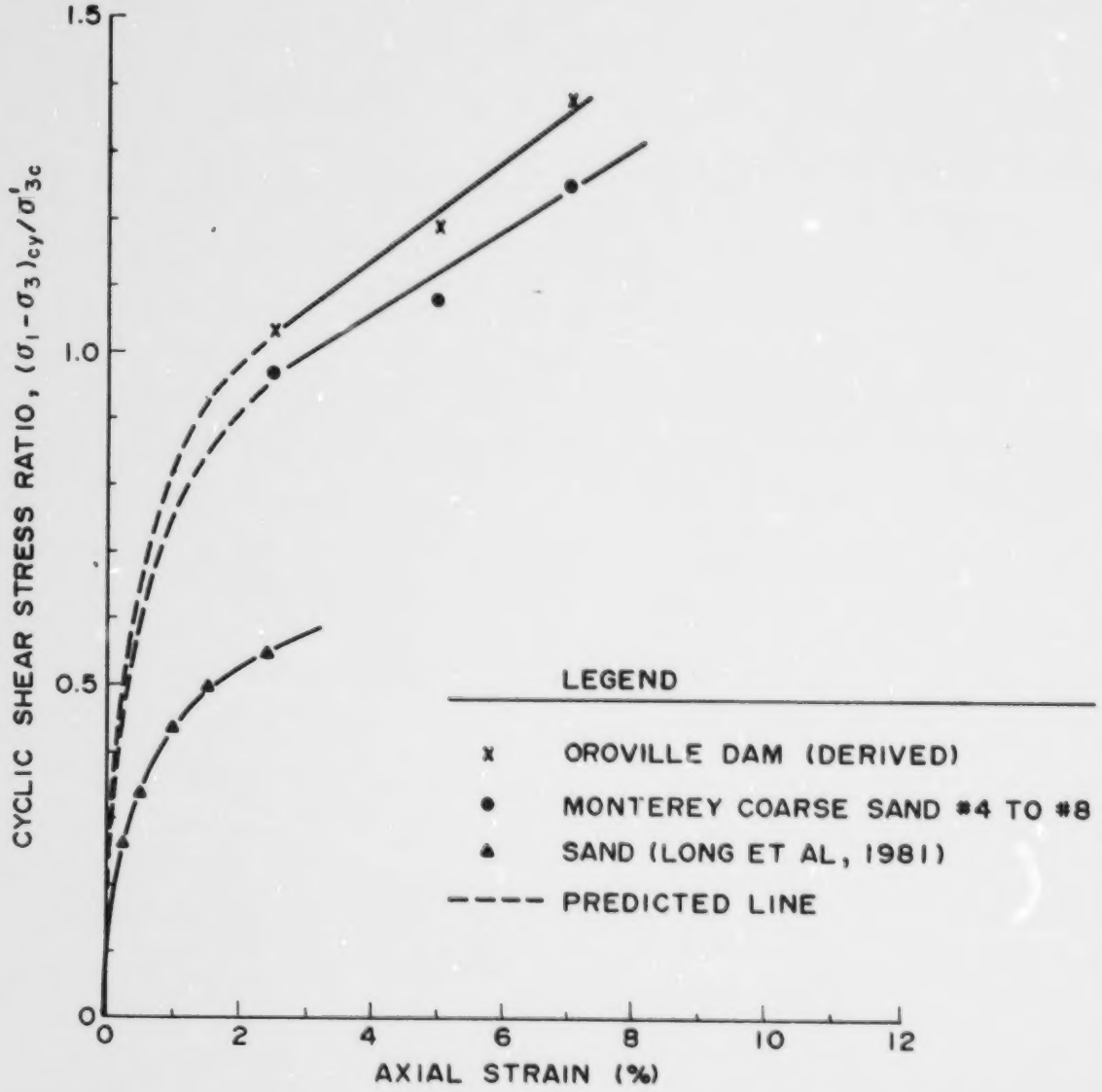
SMOKY RIVER COAL LIMITED - CANMET
DYNAMIC STABILITY OF M-1 DUMP

PITEAU ENGINEERING LTD.
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

PEAK PARTICLE VELOCITY (TRUE VECTOR SUM) VS. SCALED DISTANCE USING EFFECTIVE AVERAGE CHARGE WEIGHT

BY:	DATE:
MVC	FEB. 88
APPROVED:	FIGURE:
BH	5.7

JOB No. 962 -1



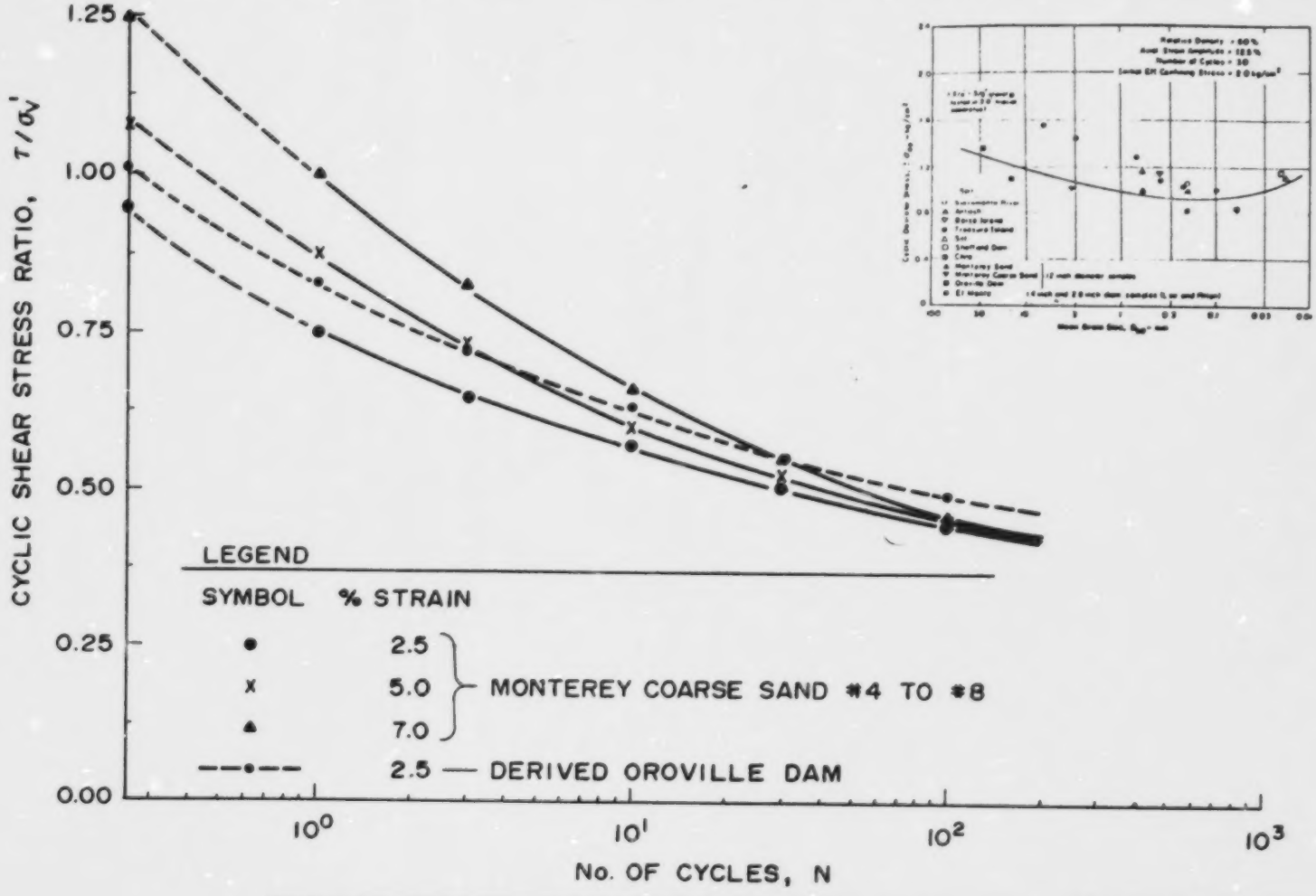
SMOKY RIVER COAL LIMITED
EFFECT OF BLAST VIBRATIONS
ON MI DUMP

PITEAU ENGINEERING LTD.
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

CYCLIC SHEAR STRESS RATIO VERSUS AXIAL STRAIN (1/4 CYCLE)

BY:	DATE:
D.T.	DEC. '86
APPROVED: TBC	FIGURE: 5.8

JOB No. 962 - 1



SMOKY RIVER COAL LIMITED
EFFECT OF BLAST VIBRATIONS
ON MI DUMP

PITEAU ENGINEERING LTD.
GEOTECHNICAL AND
HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

LIQUEFACTION RESISTANCE CURVES

BY: D.T.
DATE: DEC. '86
APPROVED: TBC
FIGURE: 5.9

6. M-1 WASTE DUMP DEFORMATION BEHAVIOUR

6.1 GENERAL

The deformation behaviour of the waste dump is assessed for Sections A-A', B-B' and C-C', shown in Figure 2.2, 2.3 and 2.4. The objective of the presentation of observed deformation behaviour is to provide a basis for indicating the mechanisms controlling deformation of the waste dump with and without blasting and environmental effects.

Slope deformations as measured on the dump surface can be the result of deformations within the dump, at the dump/foundation interface, within the foundation or a combination thereof.

6.1.1 General Aspects of Internal Deformation of Waste Dumps

Deformations within the waste rock material are considered to be vertical deformations as a result of vertical compaction and particle shifting due to in-situ stresses, as well as downstage creep deformations due to dump geometry induced internal shear stresses. Competent waste rock has a low compressibility and is not likely to exhibit time-dependent creep behaviour, therefore under static stresses competent waste rock is not expected to exhibit a global internal deformation pattern. Under the dynamic stresses induced by blasting, competent waste rock could be expected to compact to a degree related primarily to the magnitude of dynamic input and the waste rock density. Dynamically induced compaction would manifest itself at the dump surface with predominantly vertical displacements.

Due to the coarse-grained nature of competent waste rock, the presence of ponded groundwater in the dump is unlikely, and if present at the base of the dump would be expected to have negligible effect on deformation behaviour under static or dynamic loading conditions.

If the dump is composed in significant proportion or entirely of poor waste rock (degradable shales and mudstones), or incorporate significant zones of overburden, deformation behaviour could be expected to be significantly affected by the presence of relatively fine-grained material. If the waste dump has localized zones of fine-grained material, deformation behaviour would be expected to be localized and measured surface deformations would likely lack consistent trends. If, however, the presence of fine-grained material was widespread, the dump might be expected to exhibit widespread creep behaviour. The presence of groundwater would have the effect of increasing statically induced creep rates due to strain-induced excess pore pressures and the accompanying reduction in effective stresses. In addition, such saturated fine-grained material would potentially be susceptible to dynamically induced excess pore pressures, as per the worst case assumption for the pre-blasting analytical study.

6.1.2 General Aspect of Waste Dump Foundation Deformation

Displacements at the dump/foundation interface, or within the foundation material, would be expected to be typically associated with relatively fine-grained creep-susceptible overburden. The creep behaviour of a soil is a function of numerous factors, including mineralogy, stress history, in-situ stress state,

density, and moisture content. Dump induced deformation behaviour of the foundation is a result of applied shear stresses at the dump/foundation interface, which are a result of dump geometry and natural topography and stratigraphy. Downslope creep rates are directly related to the magnitude of applied downslope shear stress. The presence of groundwater could result in strain-induced excess pore pressures, reducing effective stresses in the soil mass and leading to increased creep rates.

Given reasonably consistent foundation materials underlying a portion of a waste dump, it is expected that foundation related deformations, as measured on the dump surface, would yield a global (as opposed to localized) deformation pattern.

The displacement presented in Section 4.2 has been reduced and manipulated for each prism to provide magnitude and rates of deformation, as well as directional displacement behaviour. The data are analyzed and discussed in terms of the response of sections of the dump as represented by the behaviour groups of displacement monitoring prisms, as noted above.

6.2 WASTE DUMP DEFORMATION AT SECTION AA'

Cumulative displacements of the five prisms located along Section A-A' are provided in Figures 6.1 (horizontal) and 6.2 (total). Slope face velocities for the prism locations are presented in Figure 6.3. Direction of movement, in terms of angle from north and angle from horizontal, are presented in Figures 6.4 and 6.5, respectively. Historical crest movement rates are shown plotted with data from the present study in Figure 6.6.

Based on Figure 6.6, the dump is exhibiting creep deformation behaviour and is approaching a steady state creep velocity of in the order of 10^{-4} ft/hr. Blasting appears to have had a negligible effect on the long term creep behaviour.

The dominant effect on short term creep behaviour would appear to be precipitation, which results in markedly increased deformation rates. It is interesting to note that although the dump is moving directionally the same (approximately 140° to 160° from north, Figure 6.4), different points on the dump exhibit increased deformation rates at different points in time (Figure 6.3). This could be due to localized springs, or progressive deformations in the dump foundation. All points on the dump face are moving roughly parallel to the natural slope topography, indicating that apparent creep deformations measured on the dump surface are primarily a result of creep in the foundation.

6.3 WASTE DUMP DEFORMATION AT SECTION B-B'.

Cumulative displacements of the five prisms located along Section B-B' are provided in Figures 6.7 (horizontal) and6.8 (total). Slope face velocities for the prism locations are presented in Figure 6.9. Directional movement, in terms of angle from north and angle from horizontal, are presented in Figures 6.10 and 6.11, respectively.

Figures 6.7 and 6.8 indicate that cumulative displacements increase as one moves up the slope, in a direction of increasing dump thickness. The angle of movement from horizontal also increases upslope, consistent with the increasing natural slope of the topography prior to waste rock placement. The deformation data were normalized to the square of the dump thickness, which is considered to be proportional to the tangential

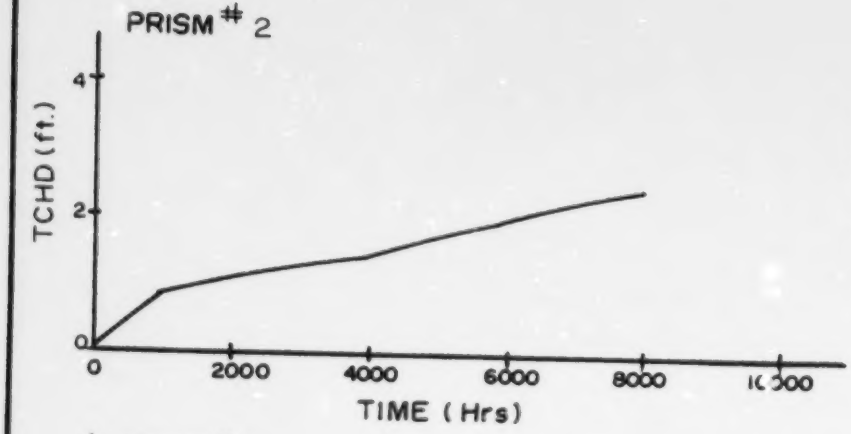
shear stress at the dump foundation interface. The results are presented in Figure 6.12 where it is observed that all points on the dump exhibit very similar normalized behaviour. This behaviour indicates that the deformations as measured on the dump face are shear stress induced deformation of the foundation material.

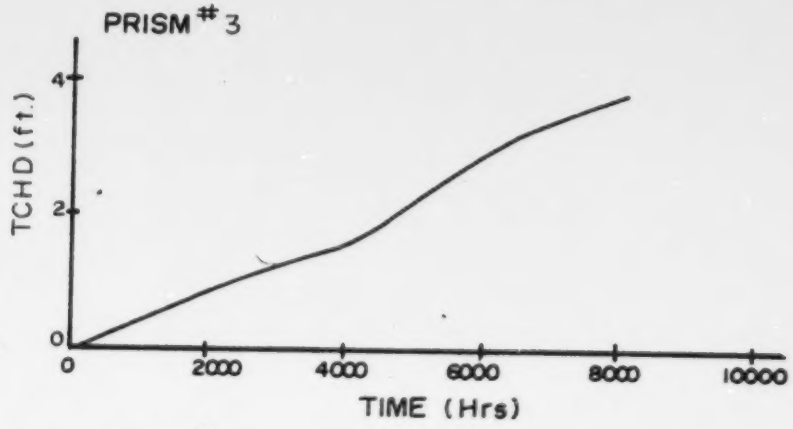
As can be observed in Figure 6.9, the dump at Section B-B' appears to be responding in a more unified fashion than was observed for Section A-A'. Accelerated deformation is attributed to precipitation and is therefore expected to be seasonal in nature. Blasting had a negligible effect on dump deformation response at Section B-B'.

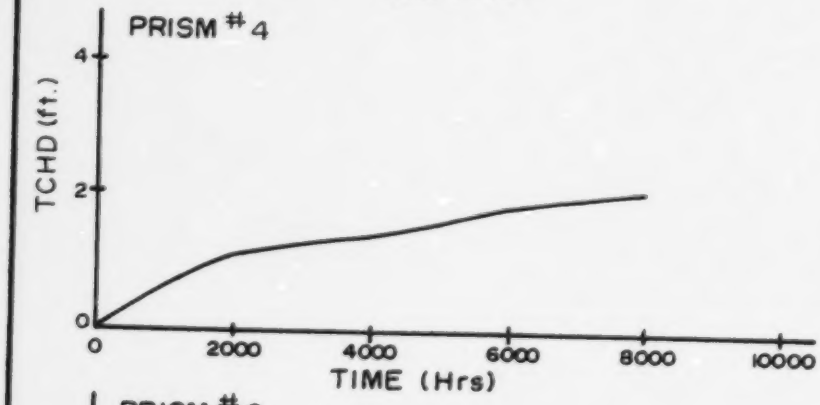
6.4 WASTE DUMP DEFORMATION AT SECTION C-C'.

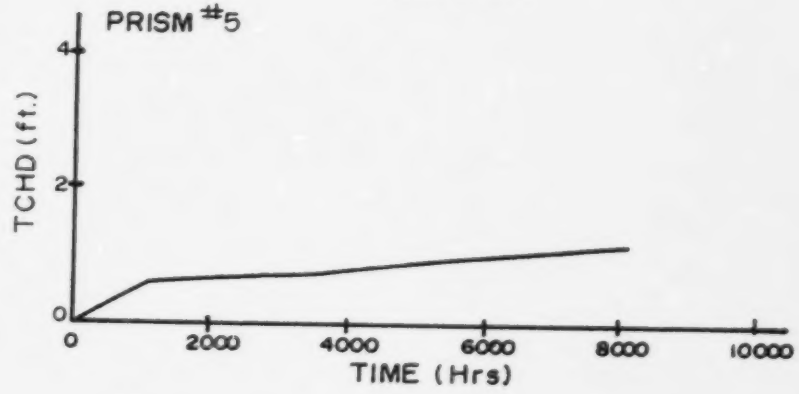
Cumulative displacements over the period from 1983 to 1986, for two prisms along Section C-C' are presented in Figures 6.13 and 6.14. Displacements along Section C-C' were not measured during the present study, however the observed response is of interest. The dump face velocity at the two prism locations is presented in Figure 6.15.

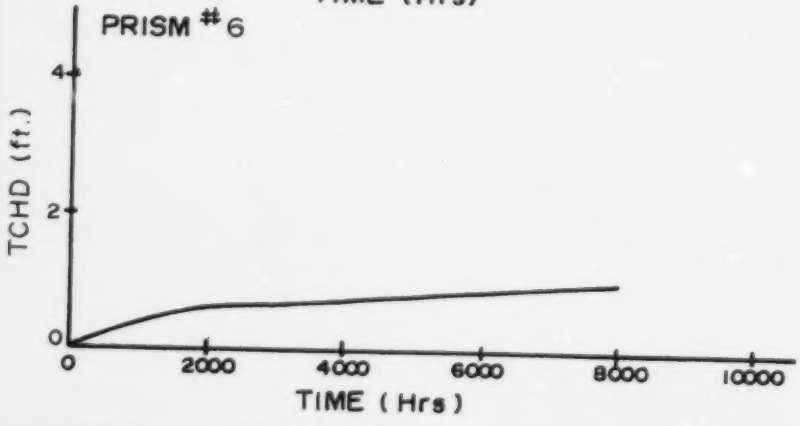
It is interesting to note that although seasonal effects can be observed, the dump at Section C-C' is moving at a rate of two orders of magnitude higher than Sections A-A' and B-B', and appears to be in a state of failure as exhibited by a continuously increasing velocity. This behaviour is representative of tertiary creep, or creep failure. This state is likely due to the relatively high proportion of degradable waste rock placed in the dump in this area, combined with relatively steep natural terrain.



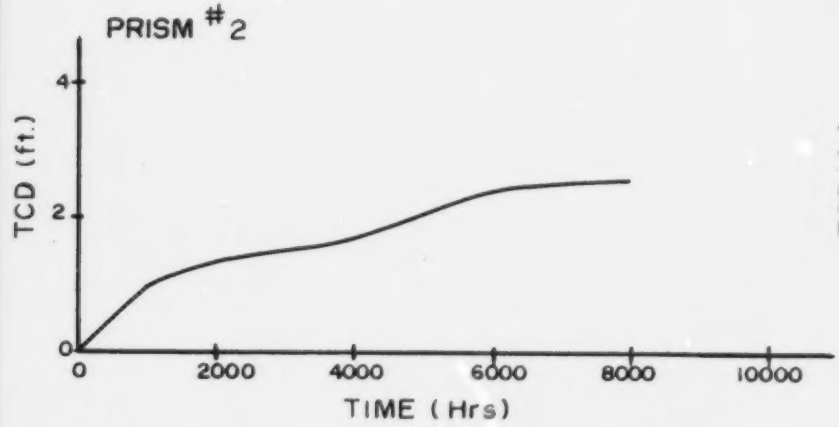


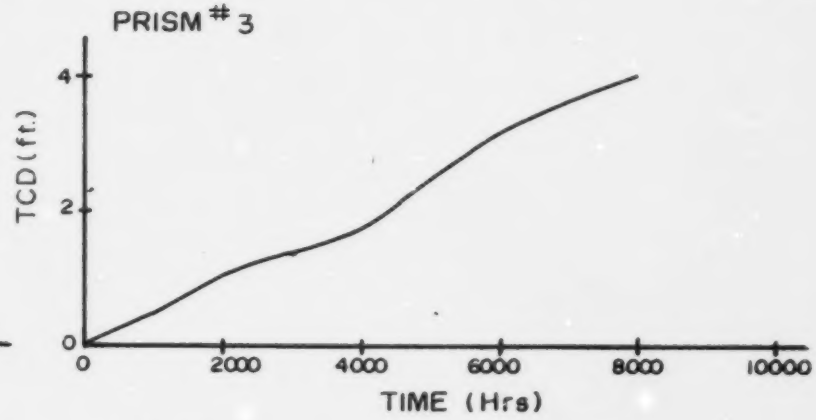


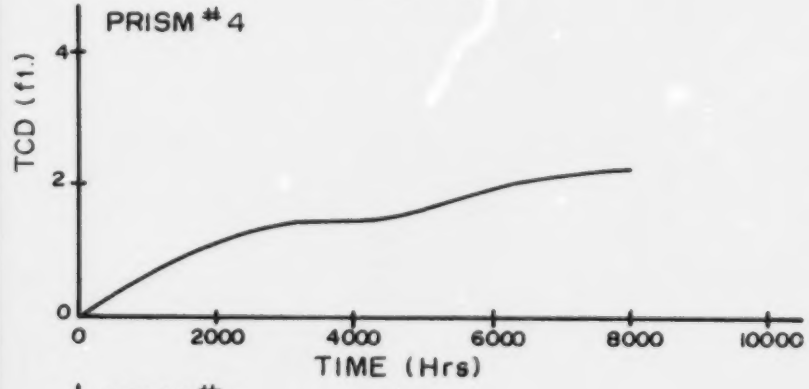


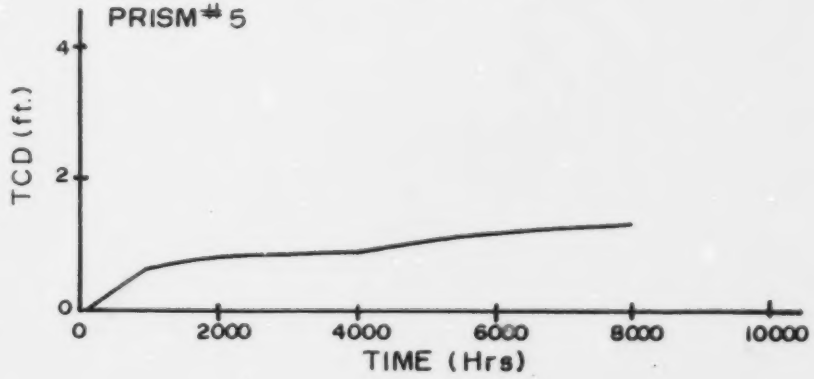


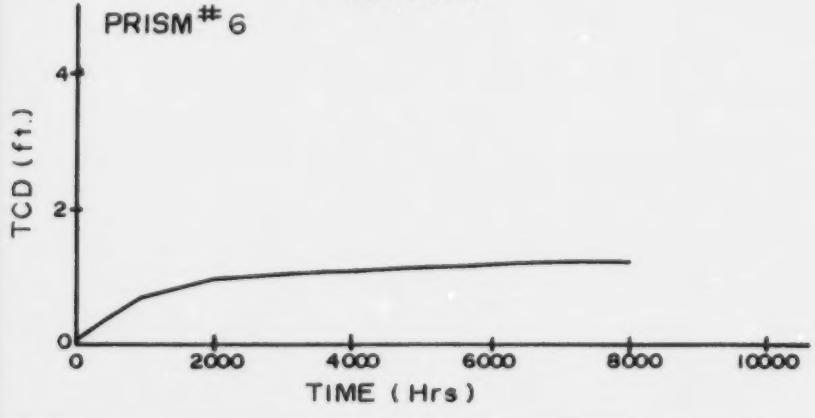
SMOKY RIVER COAL LIMITED			
CANMET M-1 DUMP STABILITY			
SECTION A-A' TOTAL CUMULATIVE HORIZONTAL DISPLACEMENT (TCHD)			
PITEAU	APPROVED: BH	DATE: NOV./88	FIGURE: 6.1



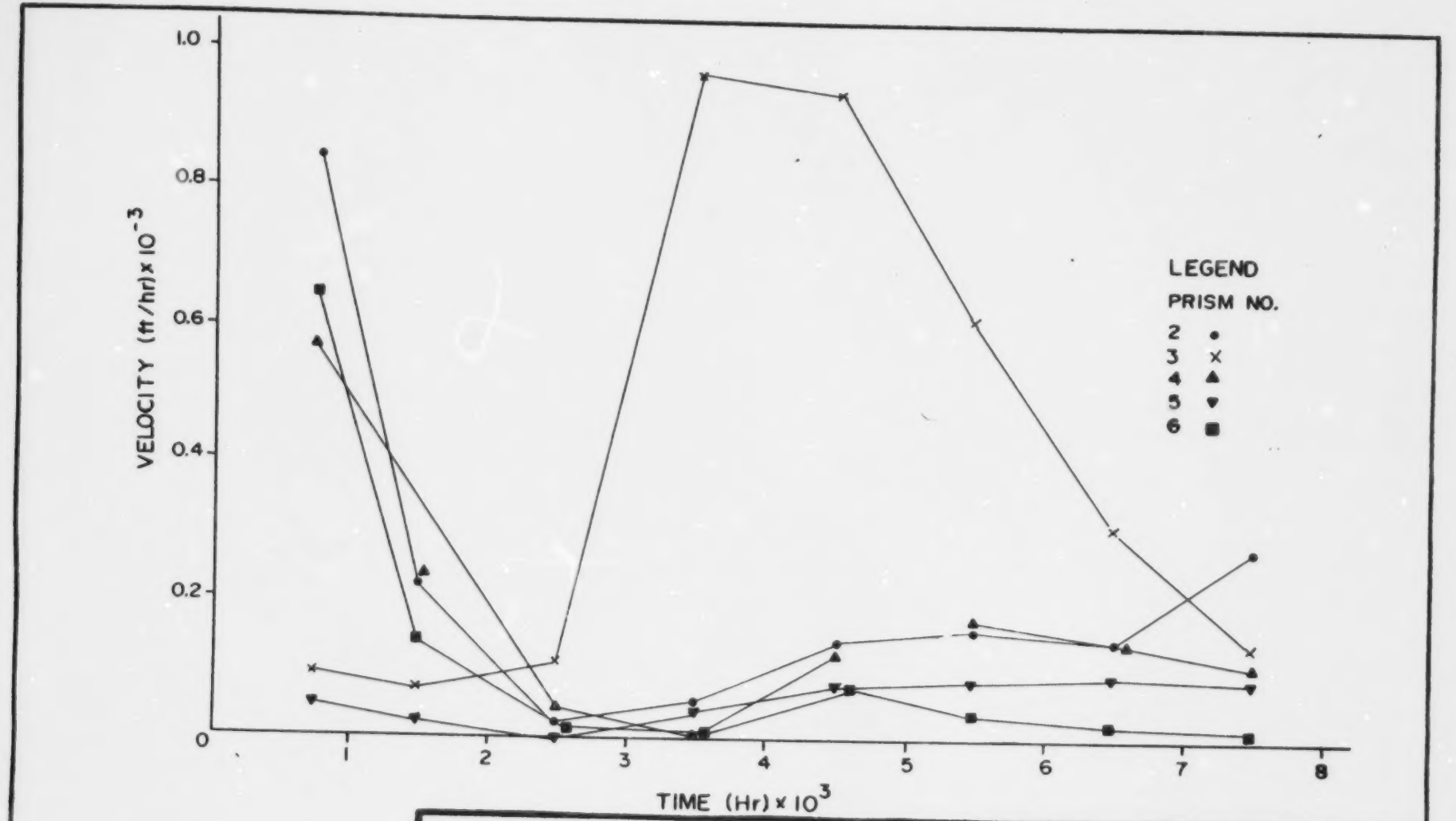








SMOKY RIVER COAL LIMITED			
CANMET M-1 DUMP STABILITY			
SECTION A-A' TOTAL CUMULATIVE DISPLACEMENT (TCD)			
PITEAU	APPROVED: BM	DATE: NOV./88	FIGURE: 6.2

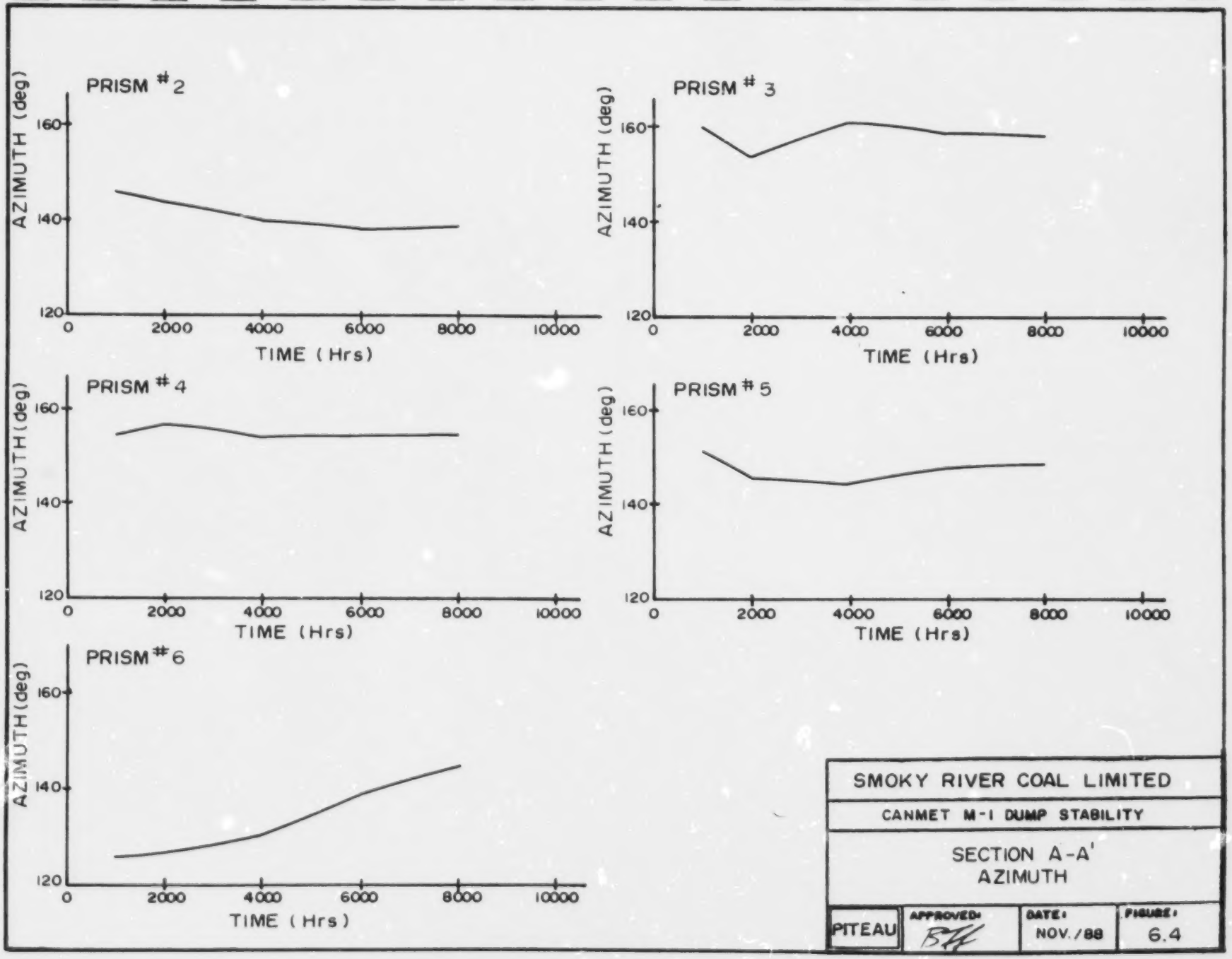


SMOKY RIVER COAL LIMITED
CANMET M-I DUMP STABILITY

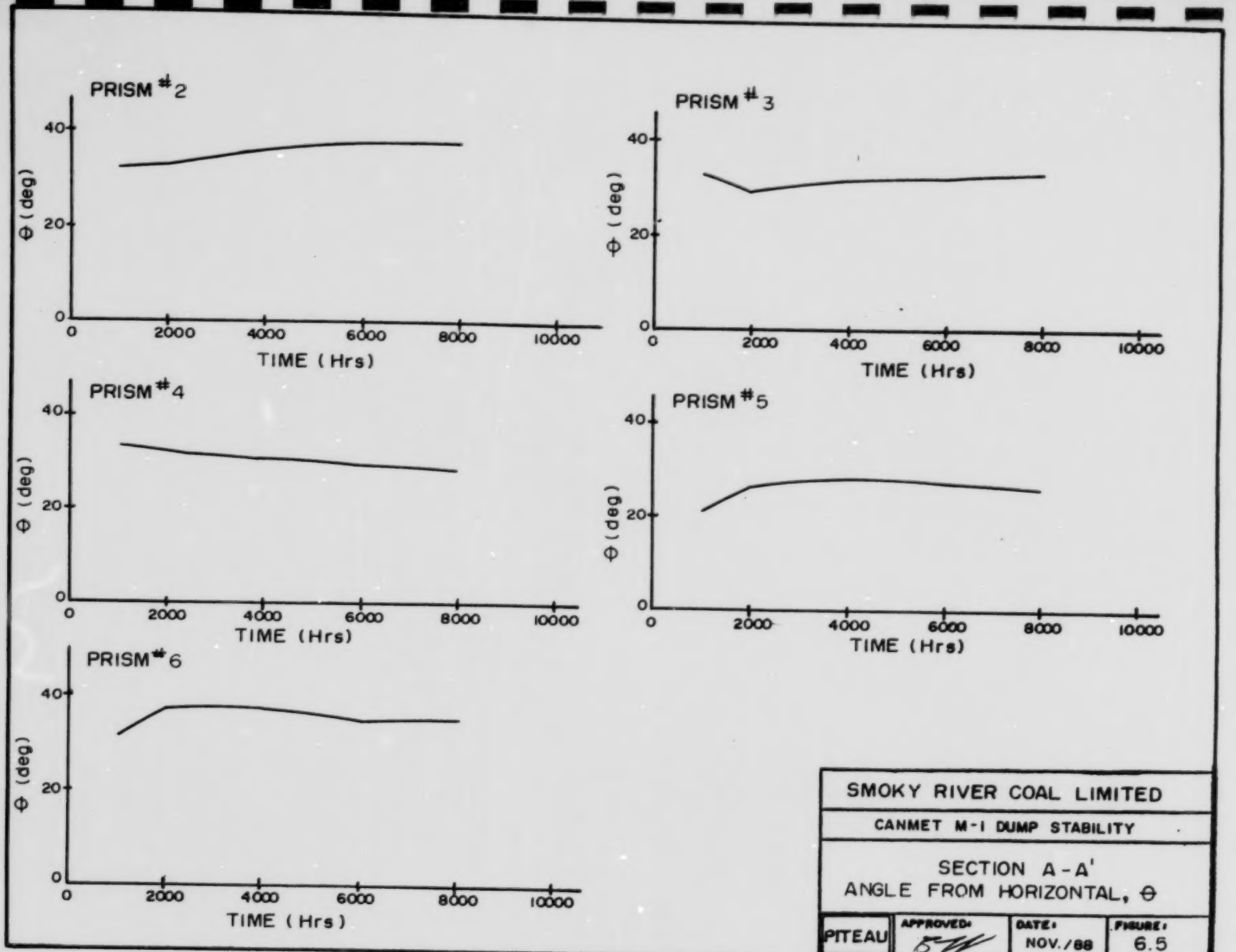
PITEAU ENGINEERING LTD.
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

SECTION A-A' SLOPE FACE VELOCITIES

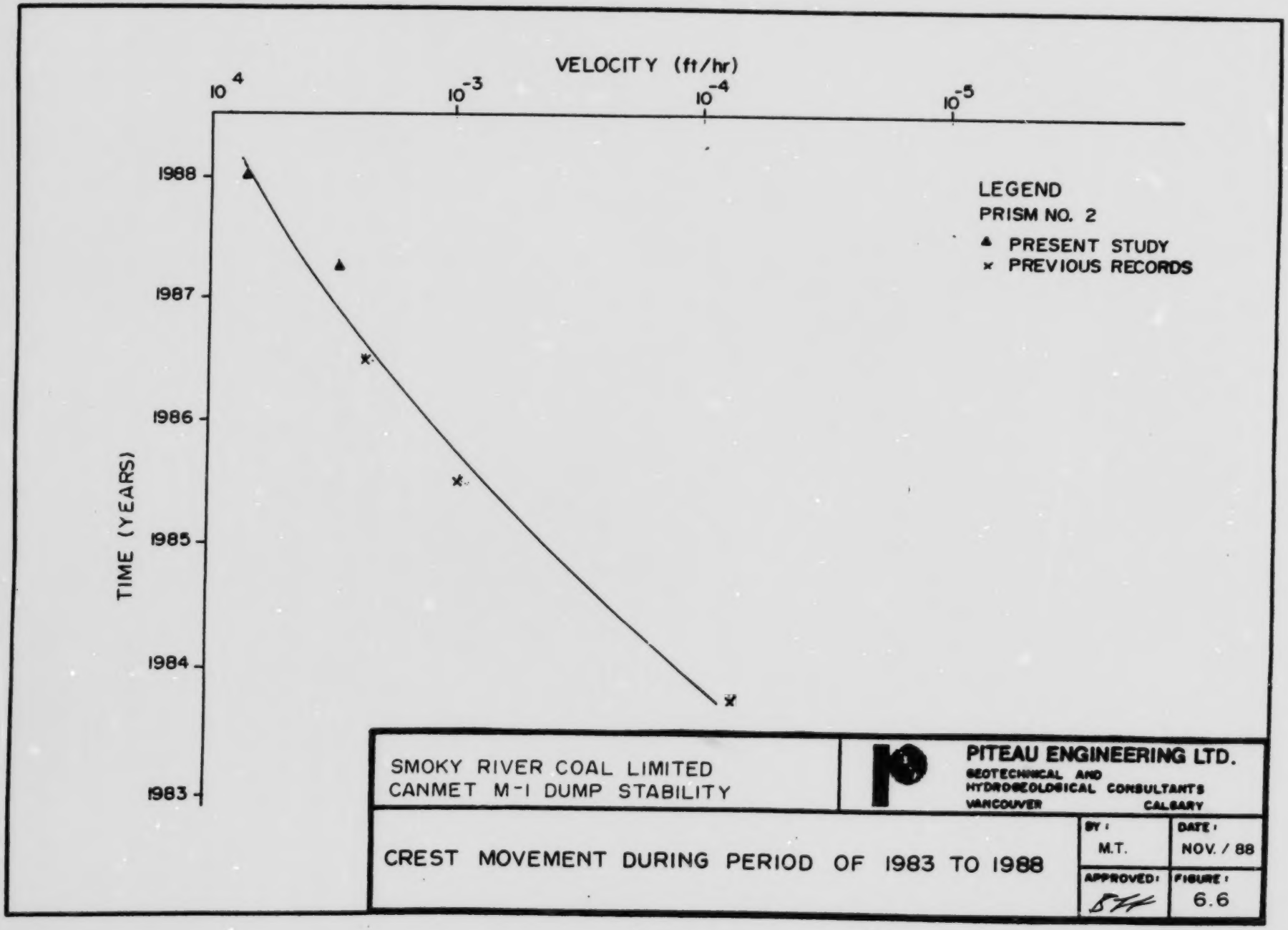
BY: M.T.
DATE: NOV./88
APPROVED:
FIGURE: 6.3

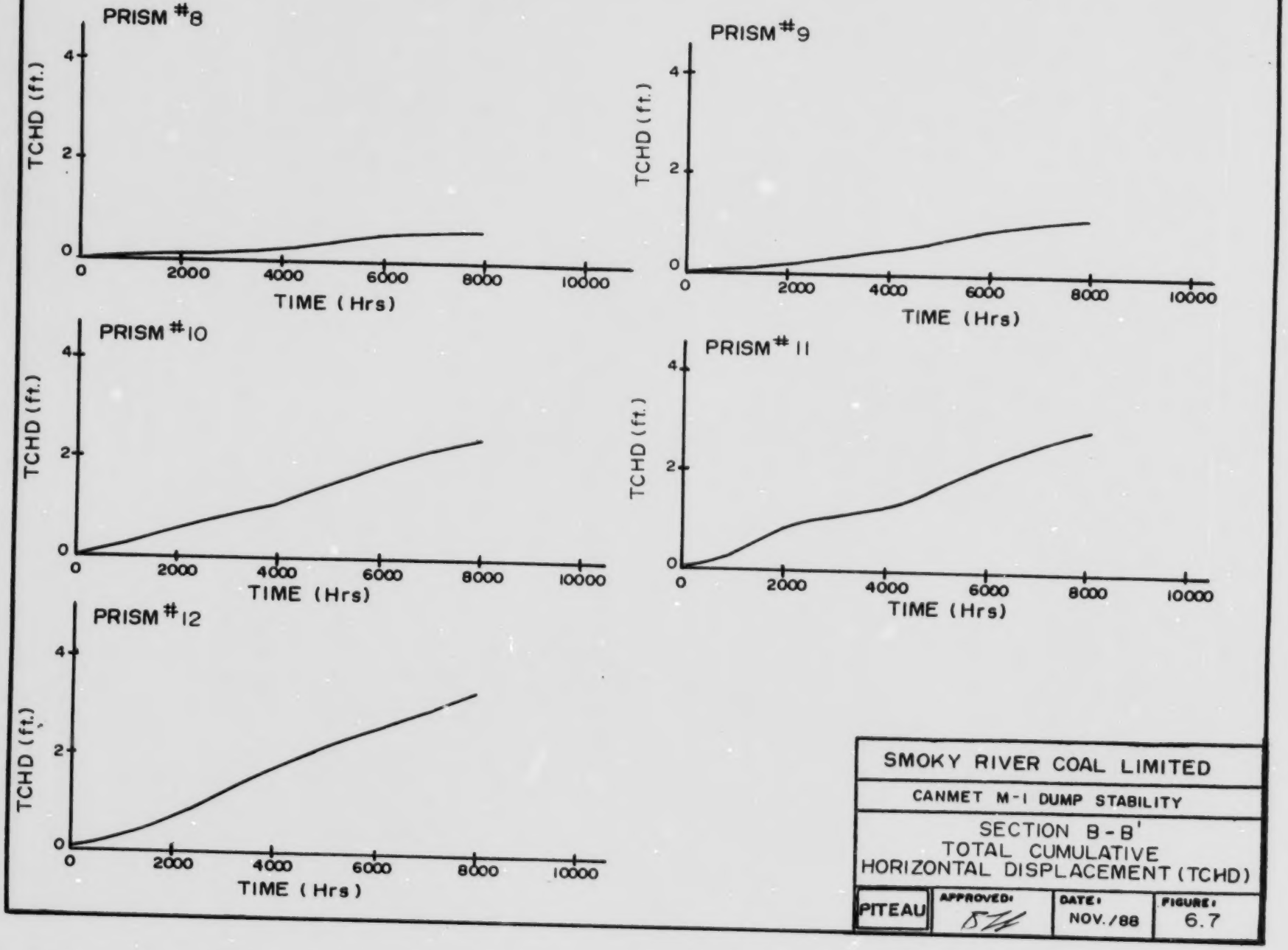


SMOKY RIVER COAL LIMITED			
CANMET M-1 DUMP STABILITY			
SECTION A-A' AZIMUTH			
PITEAU	APPROVED: BH	DATE: NOV./88	FIGURE: 6.4



SMOKY RIVER COAL LIMITED			
CANMET M-1 DUMP STABILITY			
SECTION A-A' ANGLE FROM HORIZONTAL, Θ			
PITEAU	APPROVED:	DATE: NOV./88	FIGURE: 6.5


VELOCITY (ft/hr)
10^-4
10^-3
10^-4
10^-5
1988
1987
1986
1985
1984
1983
TIME (YEARS)
LEGEND
PRISM NO. 2
▲ PRESENT STUDY
× PREVIOUS RECORDS
SMOKY RIVER COAL LIMITED
CANMET M-1 DUMP STABILITY
PITEAU ENGINEERING LTD.
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY
CREST MOVEMENT DURING PERIOD OF 1983 TO 1988
BY: M.T.
DATE: NOV. / 88
APPROVED:
FIGURE: 6.6

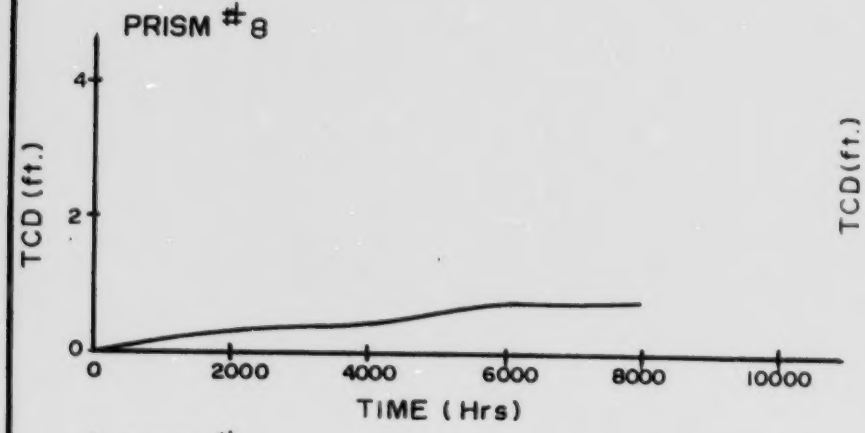


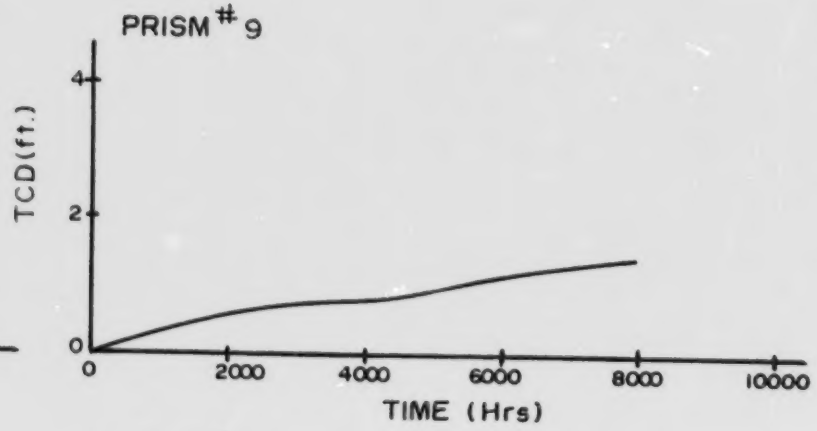
SMOKY RIVER COAL LIMITED

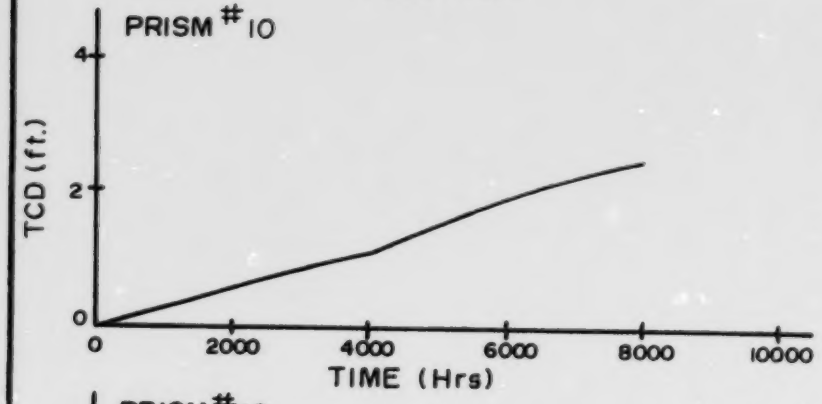
CANMET M-1 DUMP STABILITY

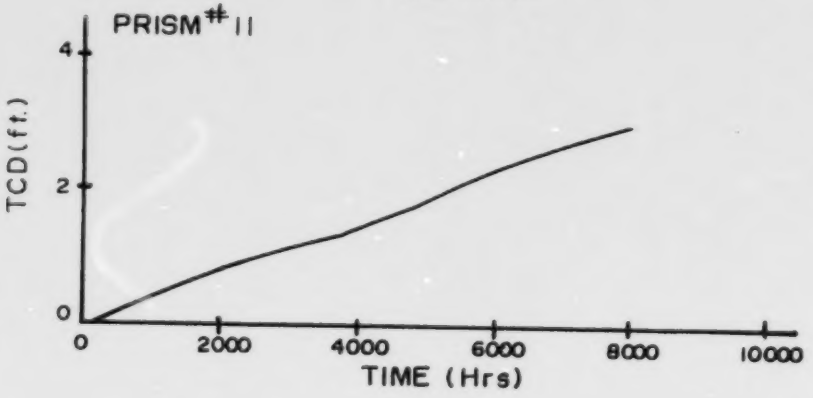
SECTION B-B'
TOTAL CUMULATIVE
HORIZONTAL DISPLACEMENT (TCHD)

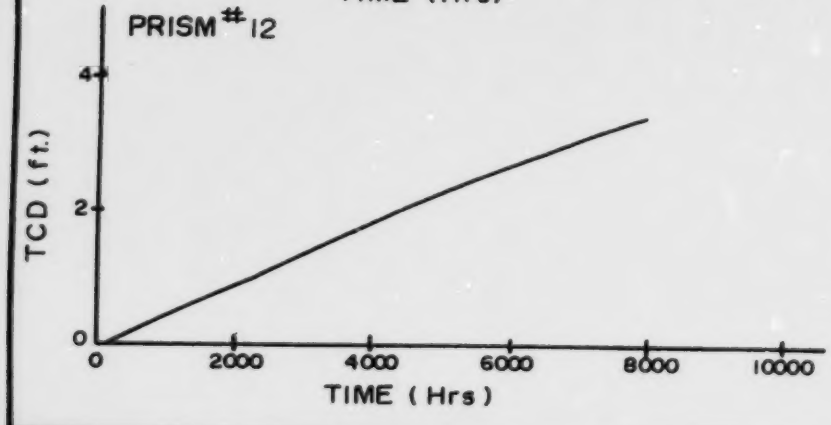
PITEAU	APPROVED:	DATE: NOV./88	FIGURE: 6.7



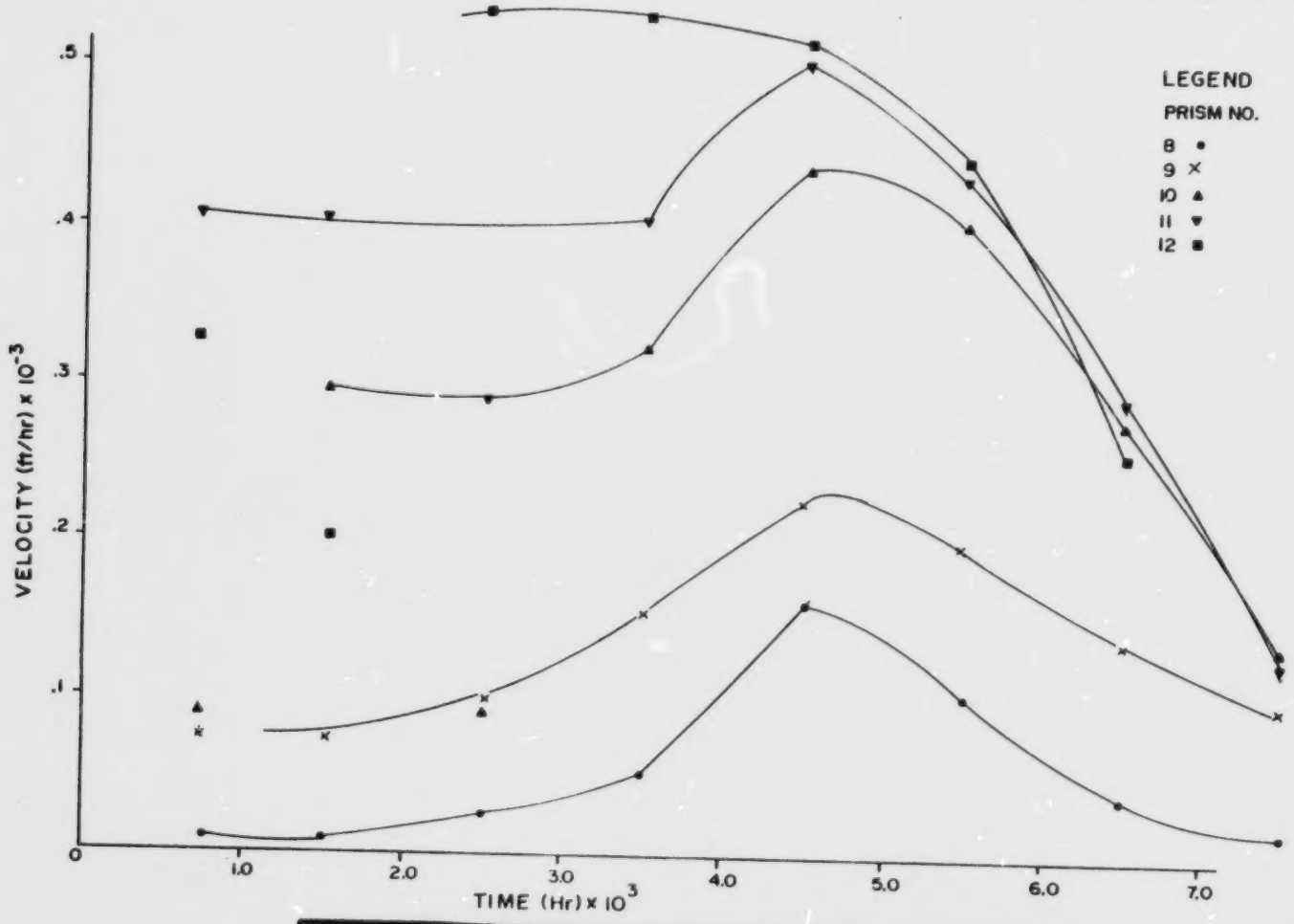








SMOKY RIVER COAL LIMITED			
CANMET M-1 DUMP STABILITY			
SECTION B-B' TOTAL CUMULATIVE DISPLACEMENT (TCD)			
PITEAU	APPROVED: BH	DATE: NOV./88	FIGURE: 6.8

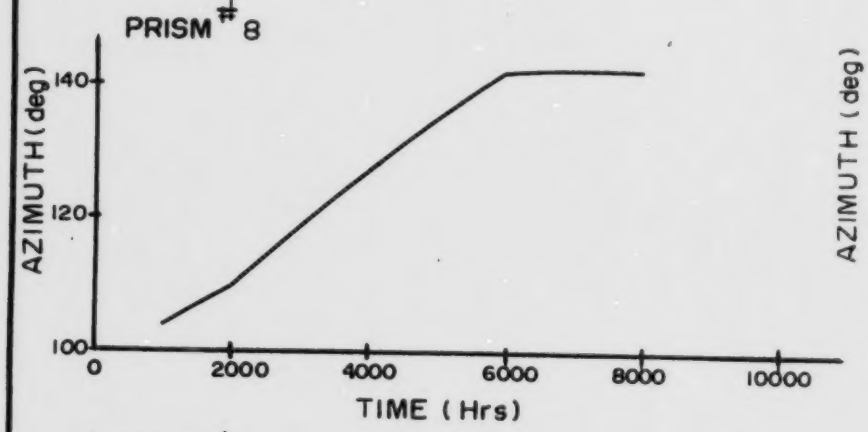


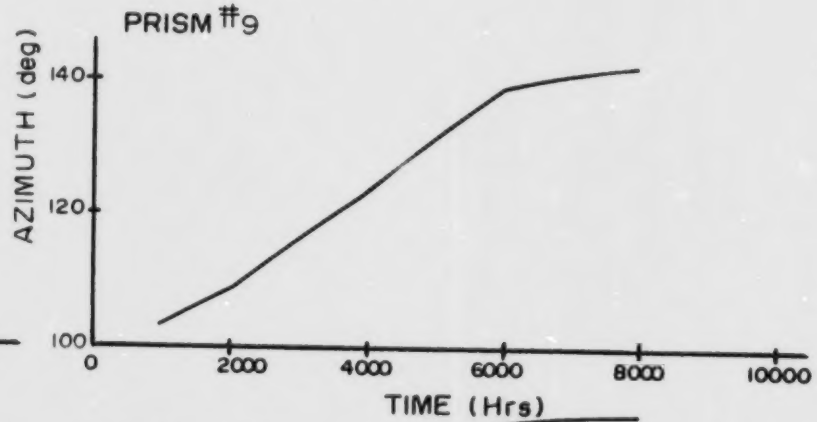
SMOKY RIVER COAL LIMITED
CANMET M-1 DUMP STABILITY

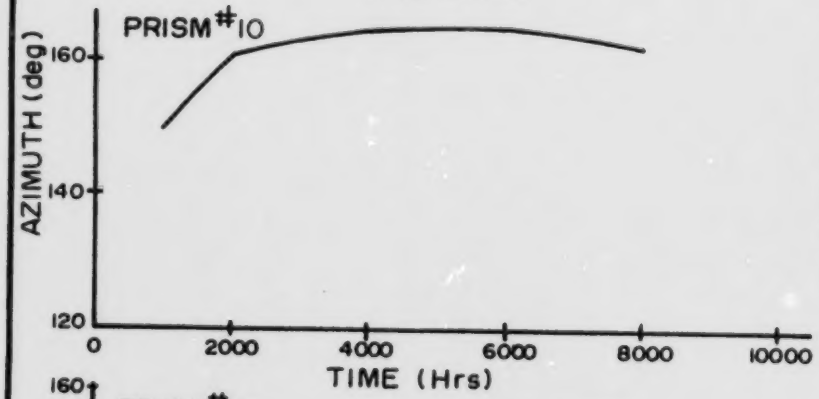
PITEAU ENGINEERING LTD.
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

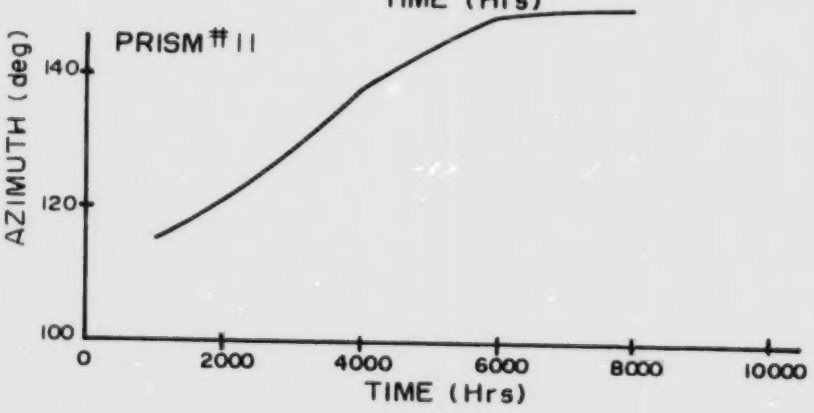
SECTION B-B SLOPE FACE VELOCITIES

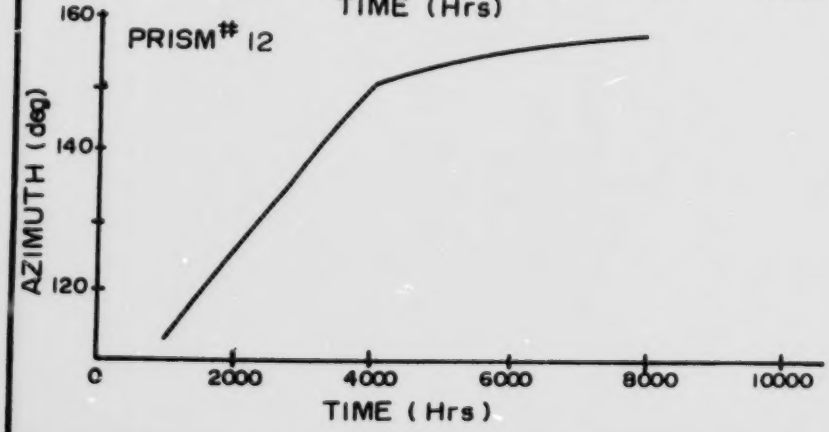
BY:	DATE:
M.T.	NOV./88
APPROVED:	FIGURE:
BH	6.9









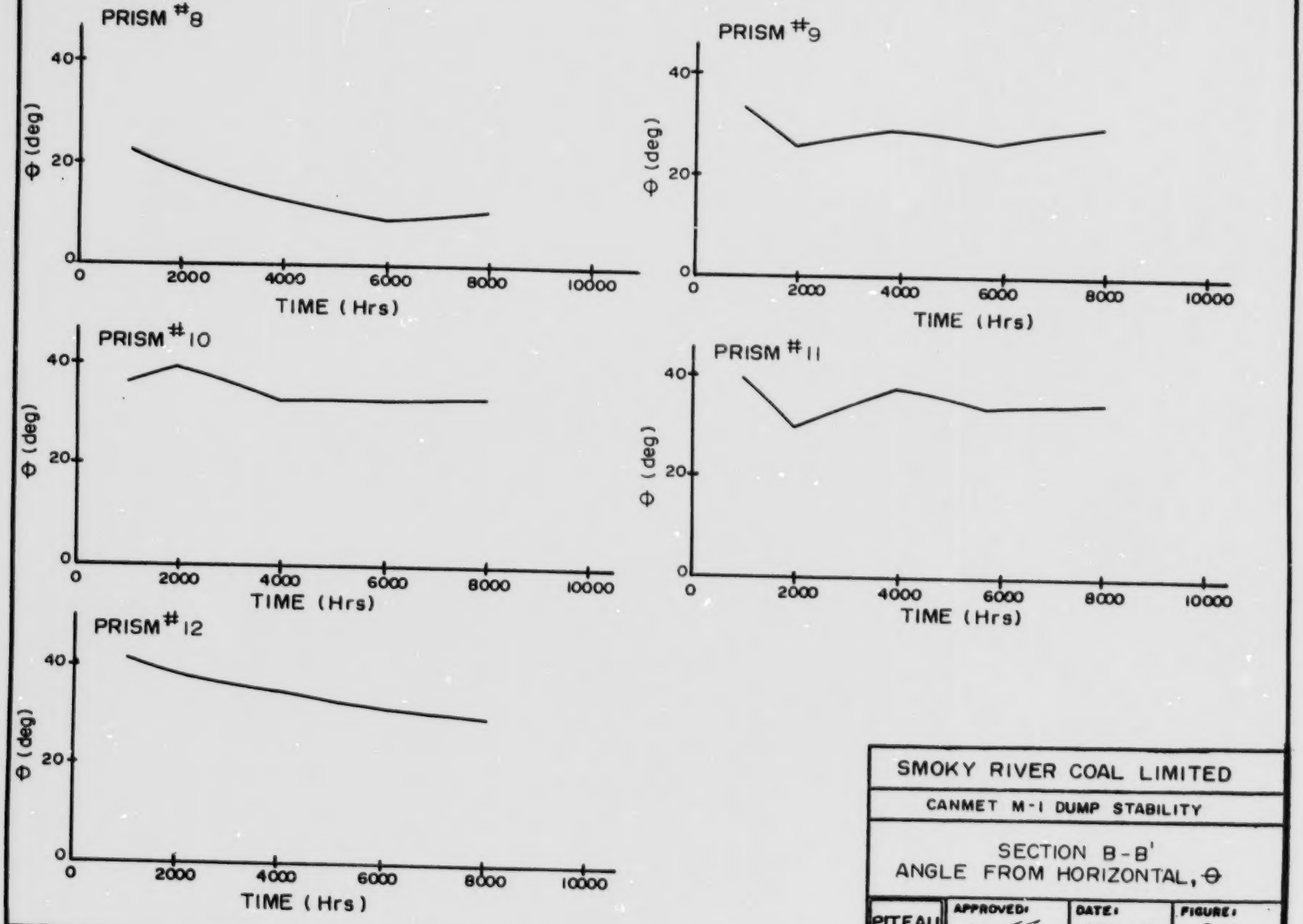


SMOKY RIVER COAL LIMITED

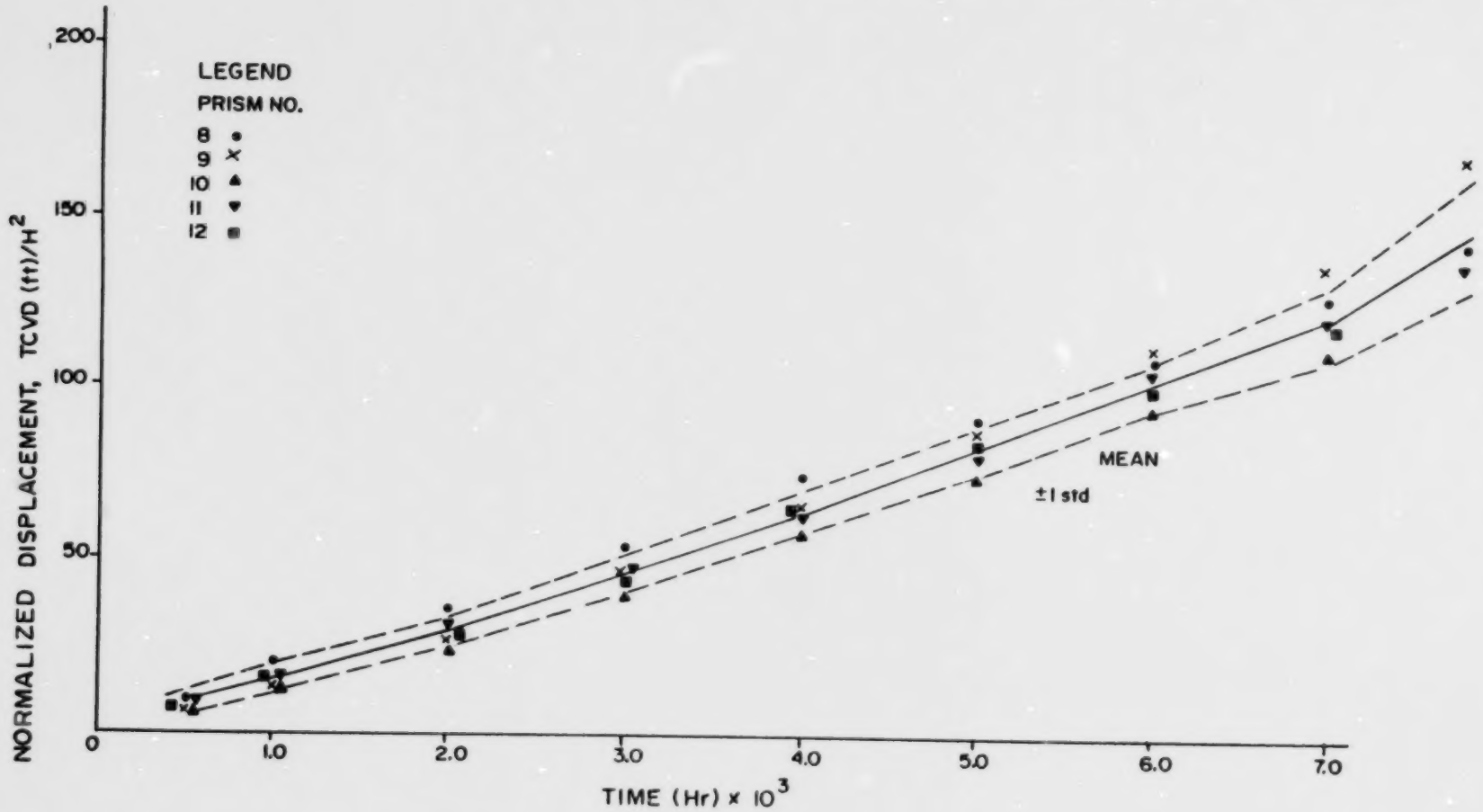
CANMET M-1 DUMP STABILITY

SECTION B-B'
AZIMUTH

PITEAU	APPROVED:	DATE: NOV./88	FIGURE: 6.10



SMOKY RIVER COAL LIMITED			
CANMET M-1 DUMP STABILITY			
SECTION B-B' ANGLE FROM HORIZONTAL, Θ			
PITEAU	APPROVED:	DATE: NOV./88	FIGURE: 6.11

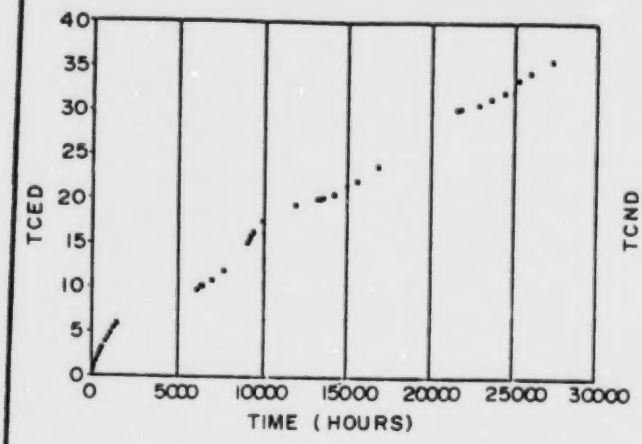


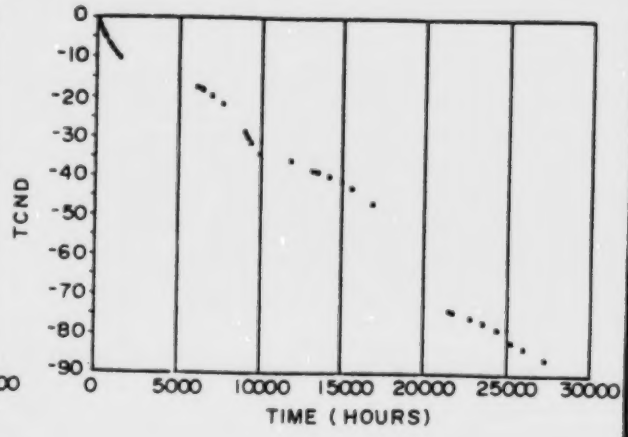
SMOKY RIVER COAL LIMITED
CANMET M-1 DUMP STABILITY

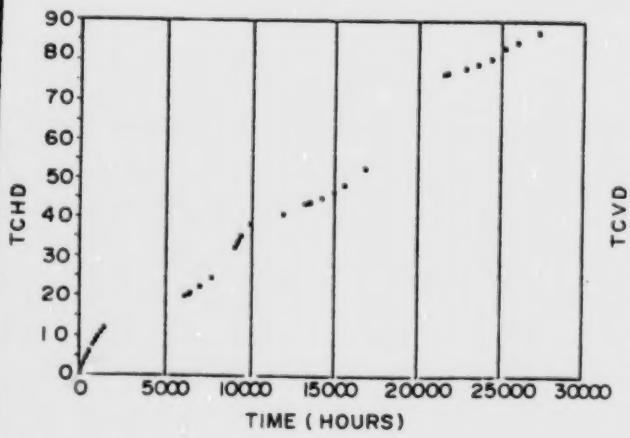
PITEAU ENGINEERING LTD.
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

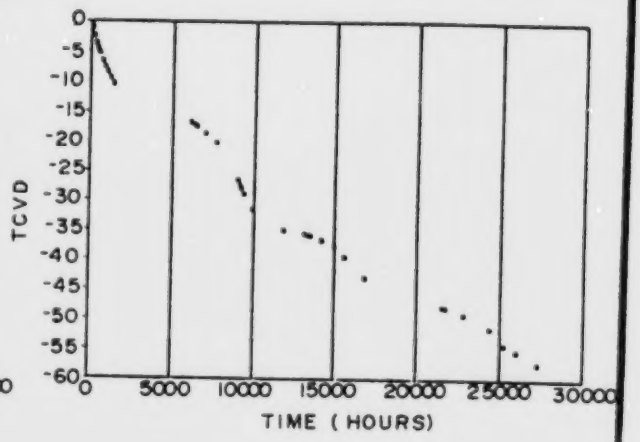
SECTION B-B'
NORMALIZED DISPLACEMENT VERSUS TIME

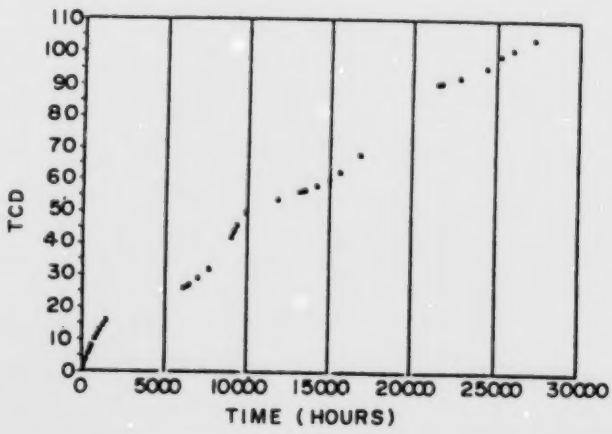
BY: M.T.
DATE: NOV./88
APPROVED:
FIGURE: 6.12









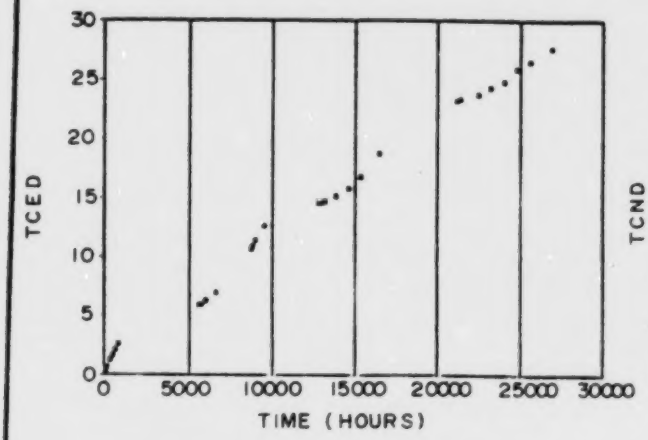


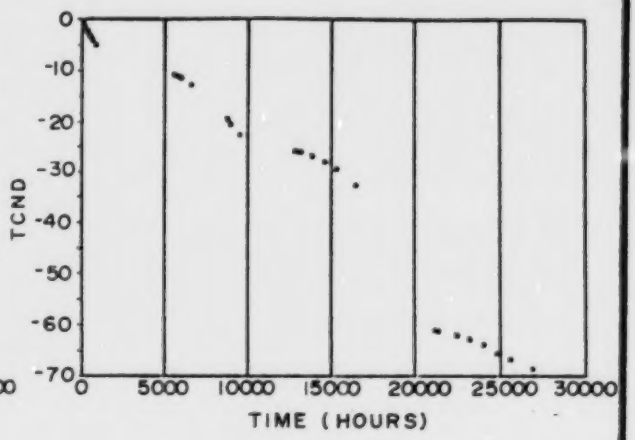
SMOKY RIVER COAL LIMITED
CANMET M-1 DUMP STABILITY

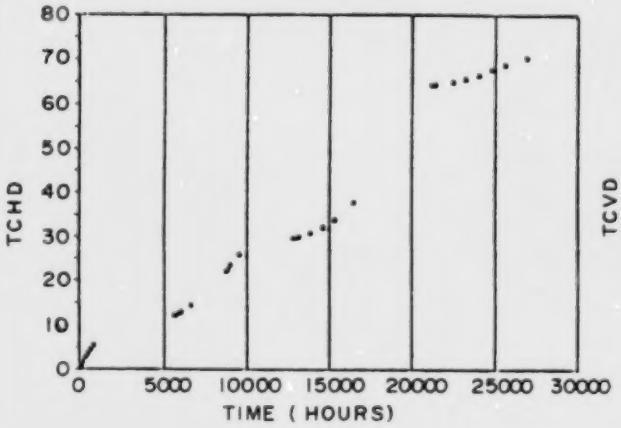
PITEAU ENGINEERING LTD.
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

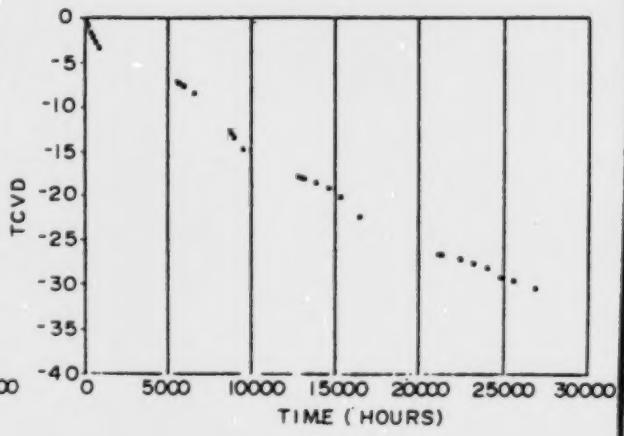
SECTION C-C'
PRISM 1A CUMULATIVE DISPLACEMENTS

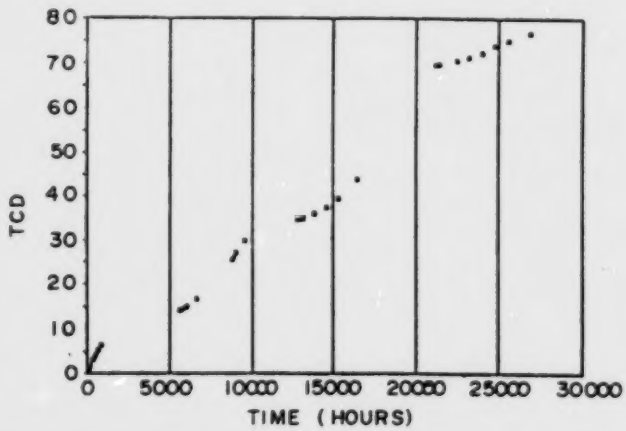
BY:	DATE:
M.T.	NOV./88
APPROVED:	FIGURE:
	6.13









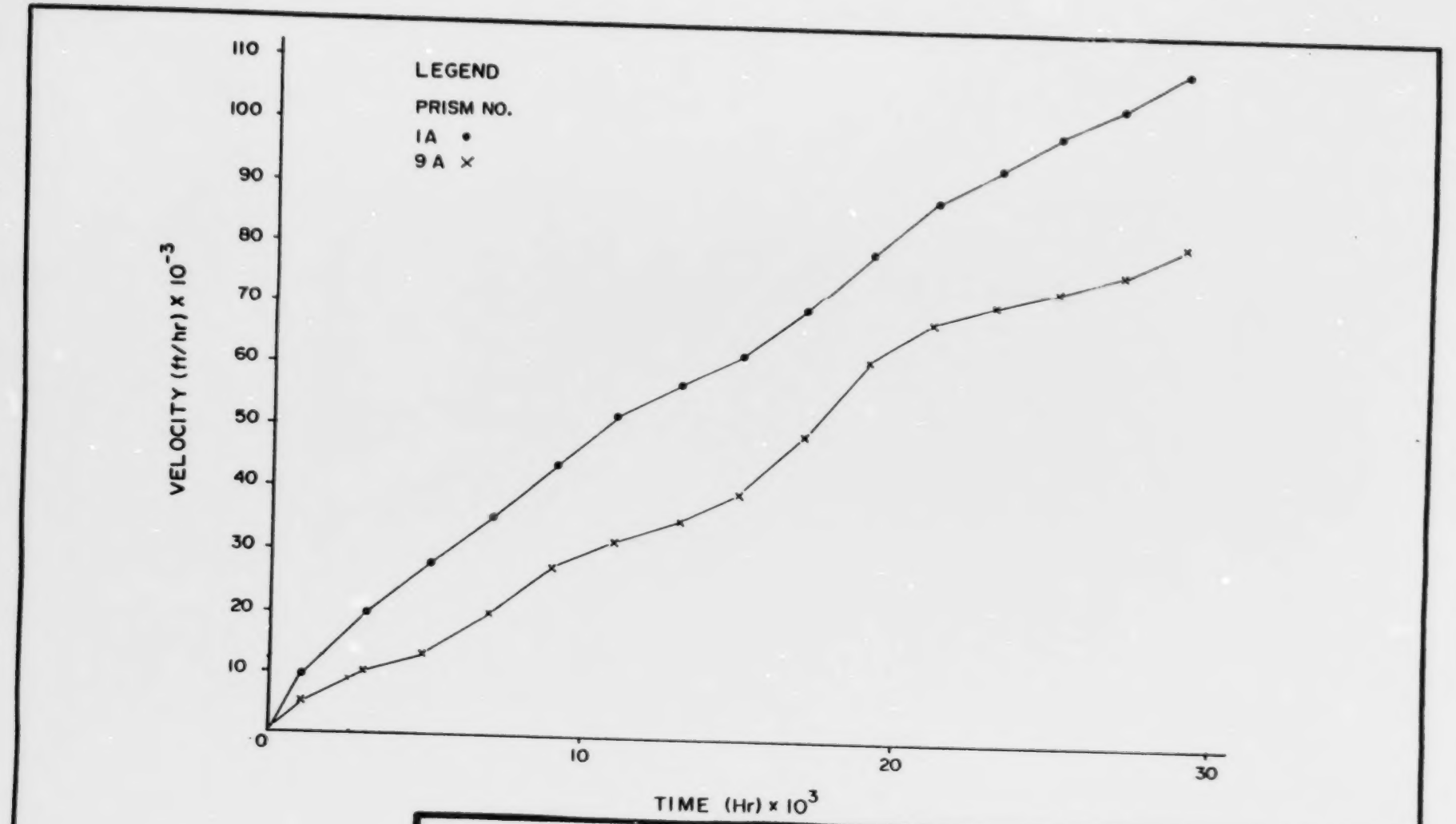


SMOKY RIVER COAL LIMITED
CANMET M-1 DUMP STABILITY

PITEAU ENGINEERING LTD.
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

SECTION C-C'
PRISM 9A CUMULATIVE DISPLACEMENTS

BY:	DATE:
M.T.	NOV./88
APPROVED:	FIGURE:
BTH	6.14



SMOKY RIVER COAL LIMITED
CANMET M-1 DUMP STABILITY

PITEAU ENGINEERING LTD.
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

SECTION C-C' DUMP FACE VELOCITIES

BY: M.T.
DATE: NOV./88
APPROVED:
FIGURE: 6.15

7. CONCLUSIONS AND RECOMMENDATIONS

It is concluded that blasting in the South Pit had negligible effect on the deformation behaviour of the M-1 dump. The predominant influences on dump deformation response were found to be precipitation, foundation conditions, natural topography, waste dump thickness and the presence of degradable waste rock.

With regard to site specific vibration attenuation, it would appar that an average charge weight per delay is more appropriate in developing a scaled distance relationship than is total charge weight or maximum charge weight per delay. Use of either of the latter should provide a reasonably conservative estimate of vibration response due to blasting.

Based on the results of this study, safe blasting can be carried out proximal to repose angle waste dumps. Proper consideration of waste dump reponse must include an assessment of those predominant factors governing quasi-static deformation behaviour, historical dump deformation behaviour, and potential blasting effects. Monitoring of dump deformation behaviour and response to blasting provides a practical methodology of ensuring operational safety.

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APPENDIX I

BOREHOLE LOGS AND PIEZOMETER CONSTRUCTION DETAILS

PITEAU ENGINEERING LTD.
HYDROGEOLOGICAL CONSULTANTS

OFFICE REPORT ON SITE INVESTIGATION

Sheet 1 of 1

Contract No. 962-4
Boring No.
Northing 47022.4'
Compiled R. MASON
Location TOE OF M-1 DUMP
Easting 98033.0'
Boring Date 1987/02/27
Contractor
Elevation 4030.3'

SAMPLE TYPES
AS Auger sample
WS Wash sample
RC Rock core
CR CRREL barrel
SS Split spoon
TO Thin wall open
TP Thin wall piston
TYPE OF RIG
SAMPLE HAMMER: wt. drop
WEATHER

SAMPLE CONDITION
Disturbed
Fair
Good
Lost

WELL INFORMATION

Depth	Symbol	METHOD	SOIL/ROCK DESCRIPTION	HYDROGEOLOGIC INFORMATION: WATER LEVEL	AIR-LIFT TEST	JOINTS AND FRACTURES	HYDRAULIC CONDUCTIVITY	DRILLING AND INSTRUMENTATION
4			LOOSE ROCK (DUMP MATERIAL)					9" dia.
8								PIEZOMETER PIPE WITH 1' SLOTTED AT BOTTOM
12			OVERBURDEN					DRILL CUTTINGS
16								
20								BENTONITE
			BEDROCK					FRAC SAND
24			END HOLE AT 22 FT					

NOTES: Depths and dimensions in feet and inches.
Piezometer contains only trace water / May 1987

R.M. HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & [illegible]

PROJECT Mc. INTYRE PORCUPINE MINES LTD.
No. 9 MINE

100430E. 3990'
48290N

HOLE NO. 12	SURFACE ELEVATION	JOB NO. cl. 2530	DATE July. 23. 1973

CORE RECOVERY Max. core fraction 10" 20" 30" 40" PERCENT 20 40 60 80	DEPTH	SYMBOL	DESCRIPTION	Minimum core fraction 2" 4" 12"	REMARKS
			SILTSTONE, grey to argillaceous brown, weak, badly weathered, thinly bedded, bedding at 45°, closely fissured, predominantly perpendicular and parallel to bedding plane		
	5'		well healed fracture perpendicular to bedding		
	10'		SHALE, grey, very weak, highly contorted, low plastic, bedding at 45° laminated, badly decomposed		
			End of hole		

PLATE 38

MTL C2-1971

R M HARDY & ASSOCIATES LTD.

GEOTECHNICAL PROFILE

PROJECT: Mc. INTYRE PORCUPINE MINES LTD. No. 9. MINE

10E SE 4802A N 3930'

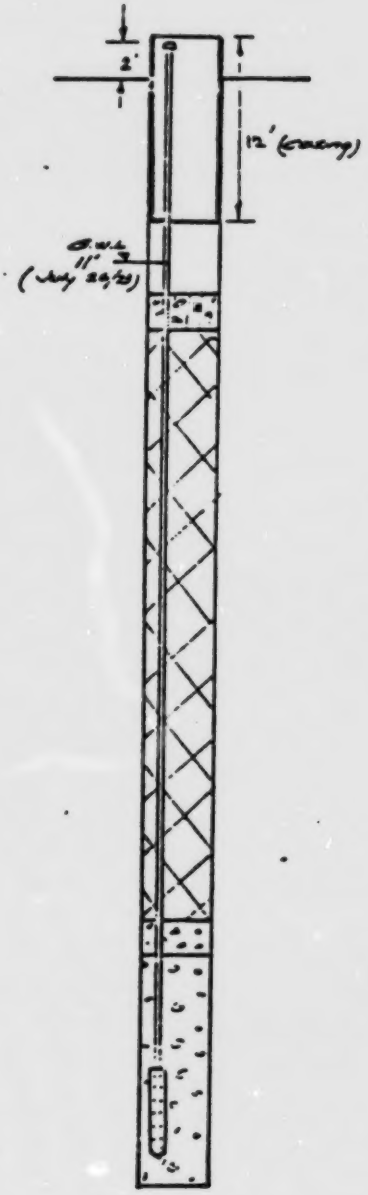
CORE RECOVERY Mech. core fraction 10° 20° 30° 40° — Pleistocene 20 40 60 80

HOLE NO. 13 | SURFACE ELEVATION | JOB NO. 61.2530 | DATE July 20. 1973

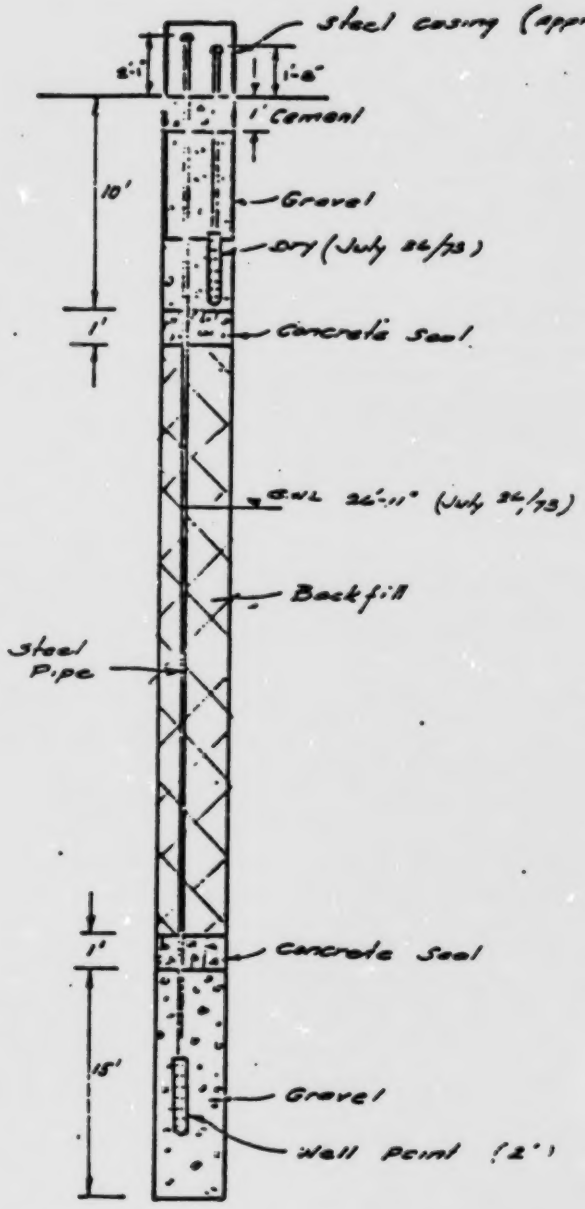
DEPTH	SECTION	DESCRIPTION	Minimum core fraction 40° 50° 60°	REMARKS
		SILT, sandy, some clay, shale and siltstone frags. brown, low plastic, dense, moist		
		---more clayey, greyish brown,		
		---sandstone cobbles,		
10		COAL, soft, thickly bedded at ≈ 0°, occasional soft shale layers		
20				
		SANDSTONE, grey, fine grained, strong, faintly weathered, thickly bedded at ≈ 0°, closely ow fissured parallel to bedding plane		
30		--- fine to med. grained, medium bedded at ≈ 0° very closely fissured predominantly perpend. to bedding		
		---finely fragmented		
		---fragmented		
40		SILTSTONE, grey to dark grey, strong, thinly laminated at ≈ 25° (bedding) same fine sand, closely fissured parallel to bedding, occasional perpendicular to bedding plane		
		---thickly bedded		
50		---light grey, thinly bedded sandstone layer 2.5' thick, strong		
		---grey, thickly bedded at ≈ 45° occasional finely fragmented		
		---closely fissured, parallel to bedding		
		SANDSTONE, grey, fine grained, strong, faintly weathered, thinly bedded at ≈ 45° closely fissured parallel to bedding with oxidized surface.		
60		---widely fissured		
		SILTSTONE, grey, strong, med. bedded at ≈ 45° interbedded with fine sandstone, widely to closely fissured, predominantly parallel to bedding plane		
70				
		---strong faintly weathered, thickly bedded at ≈ 45° dark grey		
		---occasionally fissured at 35° to bedding		
80				
90		---closely fissured (thickened)		
		---well healed fissures very closely spaced parallel to bedding		
100		---occasionally fissured		
		---well healed fissures very widely spaced parallel to bedding		
110		SANDSTONE, grey, fine grained, med. bedded at ≈ 0° very widely fissured		

PLATE 39

TH # 14



TH # 13



R.M. HARDY & ASSOCIATES LTD.
CONSULTING ENGINEERING & TESTING

MC INTYRE No. 9
PIEZOMETER INSTALLATION DETAIL

SCALE: _____ DATE: _____ DWN. _____ CHD. _____ JOB: _____ PLATE 2.26

R.M. HARDY & ASSOCIATES LTD.

GEOTECHNICAL PROFILE

99110E 4135'
48040N

PROJECT: Mc. INTYRE PORCUPINE MINES LTD. — No. 9. MINE.

CORE RECOVERY — Max. core fraction 10° 20° 30° 40° — Pleistocene 20 40 60 80

HOLE NO. 14 | SURFACE ELEVATION | JOB NO. CS. 2530 | DATE July 19. 1973

DEPTH	BEDROCK	DESCRIPTION	Minimum core fraction 0° A° B°	REMARKS
		SILT, sandy, little clay, frequent, angular pebbles, and siltstone, sandstone fragments, occ. cobbles and boulders, brown, low to non plastic, moist. Colluvium		
		frequent boulders, large sandstone fragments in clayey, some sand, frequent, angular to rounded pebbles and subangular sandstone fragments, grey, soft, alluvium plastic, colour, Till.		No. 14
		large siltstone fragments		
10		SANDSTONE, grey, fine grained, strong, thinly bedded at 35° frequent calcitic fractures perpendicular to bedding plane.		
		bouldery, highly weathered, intensely fractured		
		moderately weathered, thinly fractured		
20		fracture at 35° to bedding plane		
		fractures parallel to bedding plane, calcitic.		
30		slightly darker		
		slicken fracture		
40		fracture opens, perpendicular to bedding plane, with thin layer of weak, highly weathered siltstone		
		refractured calcite fracture, perpendicular to bedding plane		
		slickenside fracture parallel to bedding plane		
50		all fractures parallel to bedding and slicken		
		fractures parallel to bedding and slicken		
60		30° calcitic fracture parallel to bedding		
		dark grey, strong, thin layers of siltstone siltstone layers interbedded with sandstone.		
		refractured calcitic fracture perpendicular to bedding plane		
70		SILTSTONE, dark grey, strong, thinly bedded at 30° to core axis, faintly weathered. slicken fractures parallel to bedding plane		
		slicken fracture parallel to bedding plane		
80		some fractures highly weathered		
		calcitic fractures parallel and perpendicular to bedding plane coal bands		
90		numerous slicken fractures along bedding, ranging from 1-3" intervals, black		
		intensely fractured at 1/2" intervals, moderately weathered slicken sides.		
100		End of hole		

PLATE 210

APPENDIX II

BLAST DATA

PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE (ft/lb$^{1/2}$)
1	46091 101248 3531	March 2 (4000-1)	5,000	9,800	A	47040 N 98100 E 4020	3324	47
		March 20 (3970-1)	5,100	25,300	A	46970 N 98110 E 3990	3291	46
		March 23 (3715-1)	8,100	22,400	S	46510 N 98890 E 3735	2404	27
		March 24 (3715-2)	4,500	13,500	A	46470 N 99240 E 3735	2054	31
		April 10 (3670-1)	15,000	39,600	A	46440 N 99320 E 3690	1966	16
		April 17 (3715-3)	2,600	2,600	A	46070 N 99090 E 3735	2168	43
		April 24 (3715-4)	3,100	6,200	A	46070 N 99090 E 3735	2168	39
		May 5 (3670-2)	15,000	73,000	A	46969 N 98980 E 3690	2437	20
		May 13	4,100	9,600	A	46830 N 98170 E	2849	26

.../2

PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
1	46091 101248 3531	May 20 (3850-1)	12,300	47,000	S	46840 N 98520 E 3870	2849	26
		May 26 (simultaneous)						
		(3895-2)	5,900	12,900	S	46750 N	3275	43
		(3895-2)	13,800	44,900	S	98060 E 3885	3275 combined 3275	28 23
		June 4 (3850-3)	3,500	62,200	A	46800 N 98050 E 3870	3293	56
		June 5 (3670-3)	3,000	3,000	A	46560 N 99010 E 3690	2292	42
		June 6 (3670-4)	3,800	3,800	A	46550 N 99170 E 3690	2134	35
		June 12 (3625-1)	11,700	58,800	A	46380 N 98470 E 3645	2795	26
		June 22 (3805-1)	1,325	25,700	A	46720 N 98300 E 3825	3029	83
		June 22 (3940-1)	12,300	103,300	A	46940 N 98150 E 3960	3241	29

.../3

PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
1	46091 101248 3531	June 28 (3805-2)	7,400	62,600	A	46680 N 98000 E 3825	3314	39
		August 6 (3625-2)	9,475	46,605	A	46400 N 99250 E 3645	2024	21
		August 7 (3625-3)	9,475	44,190	A	46400 N 98990 E 3645	2282	23
		August 17 (3760-1)	14,760	83,125	A	46560 N 98140 E 3780	3153	26
		August 17 (3670-5)	4,200	4,200	A	46520 N 99420 E 3690	1884	29
		August 23 (3760-2)	5,030	26,810	A	46660 N 98560 E 3780	2759	39
		August 31 (3760-3)	8,120	65,675	A	46710 N 98370 E 3780	2954	33
		Sept. 8 (3715-5)	7,850	49,935	A	46500 N 98580 E 3725	2706	31

.../4

PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE (ft/lb$^{1/2}$)
1	46091 101248 3531	Sept. 9 (3760-4)	14,830	73,915	A	46680 N 98060 E 3780	3252	27
		Sept. 18 Simultaneous						
		(3715-6)	2,360	2,360	A	46600 N		57
		(3715-7)	5,160	18,275		98525 E	2777	39 27
		(3715-8)	2,745	3,445		3725		52
		Oct. 1 (3715-9)	8,840	25,700	S	46490 N 98310 E 3740	2927	32
		Oct. 2 (3715-10)	5,420	20,300	S	48630 N 98330 E 3740	3874	53
		Oct. 4 (3715-11)	8,313	32,080	S	46560 N 98140 E 3740	3150	35
		Oct. 9 (3670-6)	6,990	22,260	S	46470 N 98320 E 3690	2957	35
		Oct. 17 (3580-1)	12,610	71,606	S	48340 N 98520 E 3600	3536	31
		Oct. 20 (3670-10)	10,350	46,930	S	46540 N 98250 E 3690	3036	30
		Nov. 3 (3580-2)	9,433	15,052	S	46380 N 99100 E 3600	2168	22

PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
1	46091 101248 3531	Nov. 5 (3625-5)	4,615	13,492	S	46440 N 98790 E 3645	2485	37
		Nov. 13 (3580-3)	5,312	14,877	S	46420 N 99880 E 3600	1409	19
		Nov. 18 (3580-4)	7,520	29,250	S	46260 N 99380 E 3600	1877	22
		Nov. 26 (3625-6)	7,330	29,320	S	46480 N 98510 E 3745	2774	32

NOTES:
1. All charge weights calculated in equivalent pounds of AN/FO.
2. S = Slurry, A = AN/FO.
3. All coordinates in feet.

Dec. 20

3535-2 5920 ~~17,380~~ 14,425 S 46390 N 99050 E 3555

PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
2	48089 98169 4524	March 2 (4000-1)	5,000	9,800	A	47040 N 98100 E 4020	1166	16
		March 20 (3970-1)	5,100	25,300	A	46970 N 98110 E 3990	1241	17
		March 23 (3715-1)	8,100	22,400	S	46510 N 98890 E 3735	1907	21
		March 24 (3715-2)	4,500	13,500	A	46470 N 99240 E 3735	2095	31
		April 10 (3670-1)	15,000	39,600	A	46440 N 99320 E 3690	2177	18
		April 17 (3715-3)	2,600	2,600	A	46070 N 99090 E 3735	2355	46
		April 24 (3715-4)	3,100	6,200	A	46070 N 99090 E 3735	2355	42
		May 5 (3670-2)	15,000	73,000	A	46969 N 98980 E 3690	1615	13
		May 13	4,100	9,600	A	46830 N 98170 E		

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE (ft/lb$^{1/2}$)
2	48089 98169 4524	May 20 (3850-1)	12,300	47,000	S	46840 N 98520 E 3870	1772	16
		May 26 (simultaneous)						
		(3895-2)	5,900	12,900	S	46750 N 98060 E 3885	1488	19
		(3895-2)	13,800	44,900	S			13 11
		June 4 (3850-3)	3,500	62,200	A	46800 N 98050 E 3870	1450	25
		June 5 (3670-3)	3,000	3,000	A	46560 N 99010 E 3690	1934	35
		June 6 (3670-4)	3,800	3,800	A	46550 N 99170 E 3690	2016	33
		June 12 (3625-1)	11,700	58,800	A	46380 N 98470 E 3645	1944	18
		June 22 (3805-1)	1,325	25,700	A	46720 N 98300 E 3825	1543	42
		June 22 (3940-1)	12,300	103,300	A	46940 N 98150 E 3960	1280	12

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
2	48089 98169 4524	June 28 (3805-2)	7,400	62,600	A	46680 N 98000 E 3825	1582	18
		August 6 (3625-2)	9,475	46,605	A	46400 N 99250 E 3645	2190	22
		August 7 (3625-3)	9,475	44,190	A	46400 N 98990 E 3645	2074	21
		August 17 (3760-1)	14,760	83,125	A	46560 N 98140 E 3780	1701	14
		August 17 (3670-5)	4,200	4,200	A	46520 N 99420 E 3690	2173	34
		August 23 (3760-2)	5,030	26,810	A	46660 N 98560 E 3780	1658	23
		August 31 (3760-3)	8,120	65,675	A	46710 N 98370 E 3780	1580	18
		Sept. 8 (3715-5)	7,850	49,935	A	46500 N 98580 E 3725	1825	21

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE (ft/lb$^{1/2}$)
2	48089 98169 4524	Sept. 9 (3760-4)	14,830	73,915	A	46680 N 98060 E 3780	1597	13
		Sept. 18 Simultaneous						
		(3715-6)	2,360	2,360	A	46600 N		36
		(3715-7)	5,160	18,275		98525 E	1727	24 17
		(3715-8)	2,745	3,445		3725		33
		Oct. 1 (3715-9)	8,840	25,700	S	46490 N 98310 E 3740	1786	19
		Oct. 2 (3715-10)	5,420	20,300	S	48630 N 98330 E 3740	966	13
		Oct. 4 (3715-11)	8,313	32,080	S	46560 N 98140 E 3740	1719	19
		Oct. 9 (3670-6)	6,990	22,260	S	46470 N 98320 E 3690	1827	22
		Oct. 17 (3580-1)	12,610	71,606	S	48340 N 98520 E 3600	1020	9.1
		Oct. 20 (3670-10)	10,350	46,930	S	46540 N 98250 E 3690	1761	17
		Nov. 3 (3580-2)	9,433	15,052	S	46380 N 99100 E 3600	2154	22

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
2	48089 98169 4524	Nov. 5 (3625-5)	4,615	13,492	S	46440 N 98790 E 3645	1969	29
		Nov. 13 (3580-3)	5,312	14,877	S	46420 N 99880 E 3600	2563	35
		Nov. 18 (3580-4)	7,520	29,250	S	46260 N 99380 E 3600	2380	27
		Nov. 26 (3625-6)	7,330	29,320	S	46480 N 98510 E 3745	1820	21

NOTES:
1. All charge weights calculated in equivalent pounds of AN/FO.
2. S = Slurry, A = AN/FO.
3. All coordinates in feet.

PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
3	47934 98251 4407	March 2 (4000-1)	5,000	9,800	A	47040 N 98100 E 4020	986	14
		March 20 (3970-1)	5,100	25,300	A	46970 N 98110 E 3990	1060	15
		March 23 (3715-1)	8,100	22,400	S	46510 N 98890 E 3735	1699	19
		March 24 (3715-2)	4,500	13,500	A	46470 N 99240 E 3735	1890	28
		April 10 (3670-1)	15,000	39,600	A	46440 N 99320 E 3690	1972	16
		April 17 (3715-3)	2,600	2,600	A	46070 N 99090 E 3735	2152	42
		April 24 (3715-4)	3,100	6,200	A	46070 N 99090 E 3735	2152	39
		May 5 (3670-2)	15,000	73,000	A	46969 N 98980 E 3690	1406	11
		May 13	4,100	9,600	A	46830 N 98170 E		

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE (ft/lb$^{1/2}$)
3	47934 98251 4407	May 20 (3850-1)	12,300	47,000	S	46840 N 98520 E 3870	1248	11
		May 26 (simultaneous)						
		(3895-2)	5,900	12,900	S	46750 N	1308	17
		(3895-2)	13,800	44,900	S	98060 E 3885		11 9.3
		June 4 (3850-3)	3,500	62,200	A	46800 N 98050 E 3870	1271	21
		June 5 (3670-3)	3,000	3,000	A	46560 N 99010 E 3690	1726	32
		June 6 (3670-4)	3,800	3,800	A	46550 N 99170 E 3690	1809	29
		June 12 (3625-1)	11,700	58,800	A	46380 N 98470 E 3645	1745	16
		June 22 (3805-1)	1,325	25,700	A	46720 N 98300 E 3825	1347	37
		June 22 (3940-1)	12,300	103,300	A	46940 N 98150 E 3960	1095	9.9

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
3	47934 98251 4407	June 28 (3805-2)	7,400	62,600	A	46680 N 98000 E 3825	1405	16
		August 6 (3625-2)	9,475	46,605	A	46400 N 99250 E 3645	1983	20
		August 7 (3625-3)	9,475	44,190	A	46400 N 98990 E 3645	1865	19
		August 17 (3760-1)	14,760	83,125	A	46560 N 98140 E 3780	1514	12
		August 17 (3670-5)	4,200	4,200	A	46520 N 99420 E 3690	1970	30
		August 23 (3760-2)	5,030	26,810	A	46660 N 98560 E 3780	1453	20
		August 31 (3760-3)	8,120	65,675	A	46710 N 98370 E 3780	1380	15
		Sept. 8 (3715-5)	7,850	49,935	A	46500 N 98580 E 3725	1622	18

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
3	47934 98251 4407	Sept. 9 (3760-4)	14,830	73,915	A	46680 N 98060 E 3780	1415	12
		Sept. 18 Simultaneous						
		(3715-6)	2,360	2,360	A	46600 N	1523	31
		(3715-7)	5,160	18,275		98525 E	1523	21
		(3715-8)	2,745	3,445		3725	1523	29
		Oct. 1 (3715-9)	8,840	25,700	S	46490 N 98310 E 3740	1591	17
		Oct. 2 (3715-10)	5,420	20,300	S	48630 N 98330 E 3740	967	13
		Oct. 4 (3715-11)	8,313	32,080	S	46560 N 98140 E 3740	1531	17
		Oct. 9 (3670-6)	6,990	22,260	S	46470 N 98320 E 3690	1632	19
		Oct. 17 (3580-1)	12,610	71,606	S	48340 N 98520 E 3600	943	8
		Oct. 20 (3670-10)	10,350	46,930	S	46540 N 98250 E 3690	1568	15
		Nov. 3 (3580-2)	9,433	15,052	S	46380 N 99100 E 3600	1946	20

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
3	47934 98251 4407	Nov. 5 (3625-5)	4,615	13,492	S	46440 N 98790 E 3645	1762	26
		Nov. 13 (3580-3)	5,312	14,877	S	46420 N 99880 E 3600	2366	32
		Nov. 18 (3580-4)	7,520	29,250	S	46260 N 99380 E 3600	2174	25
		Nov. 26 (3625-6)	7,330	29,320	S	46480 N 98510 E 3745	1618	19

NOTES:
1. All charge weights calculated in equivalent pounds of AN/FO.
2. S = Slurry, A = AN/FO.
3. All coordinates in feet.

PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
4	47740 98343 4251	March 2 (4000-1)	5,000	9,800	A	47040 N 98100 E 4020	776	11
		March 20 (3970-1)	5,100	25,300	A	46970 N 98110 E 3990	846	12
		March 23 (3715-1)	8,100	22,400	S	46510 N 98890 E 3735	1442	16
		March 24 (3715-2)	4,500	13,500	A	46470 N 99240 E 3735	1638	24
		April 10 (3670-1)	15,000	39,600	A	46440 N 99320 E 3690	1720	14
		April 17 (3715-3)	2,600	2,600	A	46070 N 99090 E 3735	1901	37
		April 24 (3715-4)	3,100	6,200	A	46070 N 99090 E 3735	1901	34
		May 5 (3670-2)	15,000	73,000	A	46969 N 98980 E 3690	1147	9
		May 13	4,100	9,600	A	46830 N 98170 E		

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
4	47740 98343 4251	May 20 (3850-1)	12,300	47,000	S	46840 N 98520 E 3870	993	9
		May 26 (simultaneous)						
		(3895-2)	5,900	12,900	S	46750 N	1093	14
		(3895-2)	13,800	44,900	S	98060 E 3885	1093	9
		June 4 (3850-3)	3,500	62,200	A	46800 N 98050 E 3870	1056	18
		June 5 (3670-3)	3,000	3,000	A	46560 N 99010 E 3690	1467	27
		June 6 (3670-4)	3,800	3,800	A	46550 N 99170 E 3690	1554	25
		June 12 (3625-1)	11,700	58,800	A	46380 N 98470 E 3645	1494	14
		June 22 (3805-1)	1,325	25,700	A	46720 N 98300 E 3825	1106	30
		June 22 (3940-1)	12,300	103,300	A	46940 N 98150 E 3960	873	8

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
4	47740 98343 4251	June 28 (3805-2)	7,400	62,600	A	46680 N 98000 E 3825	1193	14
		August 6 (3625-2)	9,475	46,605	A	46400 N 99250 E 3645	1728	18
		August 7 (3625-3)	9,475	44,190	A	46400 N 98990 E 3645	1607	16
		August 17 (3760-1)	14,760	83,125	A	46560 N 98140 E 3780	1287	11
		August 17 (3670-5)	4,200	4,200	A	46520 N 99420 E 3690	1721	27
		August 23 (3760-2)	5,030	26,810	A	46660 N 98560 E 3780	1198	17
		August 31 (3760-3)	8,120	65,675	A	46710 N 98370 E 3780	1133	13
		Sept. 8 (3715-5)	7,850	49,935	A	46500 N 98580 E 3725	1368	15

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE (ft/lb$^{1/2}$)
4	47740 98343 4251	Sept. 9 (3760-4)	14,830	73,915	A	46680 N 98060 E 3780	1194	10
		Sept. 18 Simultaneous						
		(3715-6)	2,360	2,360	A	46600 N	1269	26
		(3715-7)	5,160	18,275		98525 E	1269	18
		(3715-8)	2,745	3,445		3725	1269	24
		Oct. 1 (3715-9)	8,840	25,700	S	46490 N 98310 E 3740	1351	14
		Oct. 2 (3715-10)	5,420	20,300	S	48630 N 98330 E 3740	1026	14
		Oct. 4 (3715-11)	8,313	32,080	S	46560 N 98140 E 3740	1302	14
		Oct. 9 (3670-6)	6,990	22,260	S	46470 N 98320 E 3690	1389	17
		Oct. 17 (3580-1)	12,610	71,606	S	48340 N 98520 E 3600	903	8
		Oct. 20 (3670-10)	10,350	46,930	S	46540 N 98250 E 3690	1328	13
		Nov. 3 (3580-2)	9,433	15,052	S	46380 N 99100 E 3600	1687	17

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
4	47740 98343 4251	Nov. 5 (3625-5)	4,615	13,492	S	46440 N 98790 E 3645	1502	22
		Nov. 13 (3580-3)	5,312	14,877	S	46420 N 99880 E 3600	2128	29
		Nov. 18 (3580-4)	7,520	29,250	S	46260 N 99380 E 3600	1921	22
		Nov. 26 (3625-6)	7,330	29,320	S	46480 N 98510 E 3745	1368	16

NOTES:
1. All charge weights calculated in equivalent pounds of AN/FO.
2. S = Slurry, A = AN/FO.
3. All coordinates in feet.

PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
5	47516 98420 4138	March 2 (4000-1)	5,000	9,800	A	47040 N 98100 E 4020	586	8.28
		March 20 (3970-1)	5,100	25,300	A	46970 N 98110 E 3990	645	9.03
		March 23 (3715-1)	8,100	22,400	S	46510 N 98890 E 3735	1181	13
		March 24 (3715-2)	4,500	13,500	A	46470 N 99240 E 3735	1389	21
		April 10 (3670-1)	15,000	39,600	A	46440 N 99320 E 3690	1473	12
		April 17 (3715-3)	2,600	2,600	A	46070 N 99090 E 3735	1644	32
		April 24 (3715-4)	3,100	6,200	A	46070 N 99090 E 3735	1644	30
		May 5 (3670-2)	15,000	73,000	A	46969 N 98980 E 3690	902	7.36
		May 13	4,100	9,600	A	46830 N 98170 E		

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE (ft/lb$^{1/2}$)
5	47516 98420 4138	May 20 (3850-1)	12,300	47,000	S	46840 N 98520 E 3870	734	6.62
		May 26 (simultaneous)						
		(3895-2)	5,900	12,900	S	46750 N	883	11
		(3895-2)	13,800	44,900	S	98060 E 3885	883	7.5
		June 4 (3850-3)	3,500	62,200	A	46800 N 98050 E 3870	849	14
		June 5 (3670-3)	3,000	3,000	A	46560 N 99010 E 3690	1209	22
		June 6 (3670-4)	3,800	3,800	A	46550 N 99170 E 3690	1302	21
		June 12 (3625-1)	11,700	58,800	A	46380 N 98470 E 3645	1240	11
		June 22 (3805-1)	1,325	25,700	A	46720 N 98300 E 3825	864	24
		June 22 (3940-1)	12,300	103,300	A	46940 N 98150 E 3960	661	5.96

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
5	47516 98420 4138	June 28 (3805-2)	7,400	62,600	A	46680 N 98000 E 3825	987	11
		August 6 (3625-2)	9,475	46,605	A	46400 N 99250 E 3645	1476	15
		August 7 (3625-3)	9,475	44,190	A	46400 N 98990 E 3645	1347	14
		August 17 (3760-1)	14,760	83,125	A	46560 N 98140 E 3780	1059	8.71
		August 17 (3670-5)	4,200	4,200	A	46520 N 99420 E 3690	1481	23
		August 23 (3760-2)	5,030	26,810	A	46660 N 98560 E 3780	938	13
		August 31 (3760-3)	8,120	65,675	A	46710 N 98370 E 3780	883	9.80
		Sept. 8 (3715-5)	7,850	49,935	A	46500 N 98580 E 3725	1108	12

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE (ft/lb$^{1/2}$)
5	47516 98420 4138	Sept. 9 (3760-4)	14,830	73,915	A	46680 N 98060 E 3780	978	8.03
		Sept. 18 Simultaneous (3715-6) (3715-7) (3715-8)	 2,360 5,160 2,745	 2,360 18,275 3,445	 A	 46600 N 98525 E 3725	 1010 1010	 21 14
		Oct. 1 (3715-9)	8,840	25,700	S	46490 N 98310 E 3740	1010	19
		Oct. 2 (3715-10)	5,420	20,300	S	48630 N 98330 E 3740	1186	16
		Oct. 4 (3715-11)	8,313	32,080	S	46560 N 98140 E 3740	1073	12
		Oct. 9 (3670-6)	6,990	22,260	S	46470 N 98320 E 3690	1142	14
		Oct. 17 (3580-1)	12,610	71,606	S	48340 N 98520 E 3600	989	8.81
		Oct. 20 (3670-10)	10,350	46,930	S	46540 N 98250 E 3690	1087	11
		Nov. 3 (3580-2)	9,433	15,052	S	46380 N 99100 E 3600	1429	15

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
5	47516 98420 4138	Nov. 5 (3625-5)	4,615	13,492	S	46440 N 98790 E 3645	1240	18
		Nov. 13 (3580-3)	5,312	14,877	S	46420 N 99880 E 3600	1903	26
		Nov. 18 (3580-4)	7,520	29,250	S	46260 N 99380 E 3600	1670	19
		Nov. 26 (3625-6)	7,330	29,320	S	46480 N 98510 E 3745	1112	13

NOTES:
1. All charge weights calculated in equivalent pounds of AN/FO.
2. S = Slurry, A = AN/FO.
3. All coordinates in feet.

PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
6	47302 98508 4013	March 2 (4000-1)	5,000	9,800	A	47040 N 98100 E 4020	485	6.86
		March 20 (3970-1)	5,100	25,300	A	46970 N 98110 E 3990	519	7.26
		March 23 (3715-1)	8,100	22,400	S	46510 N 98890 E 3735	922	10
		March 24 (3715-2)	4,500	13,500	A	46470 N 99240 E 3735	1143	17
		April 10 (3670-1)	15,000	39,600	A	46440 N 99320 E 3690	1227	10
		April 17 (3715-3)	2,600	2,600	A	46070 N 99090 E 3735	1391	27
		April 24 (3715-4)	3,100	6,200	A	46070 N 99090 E 3735	1391	25
		May 5 (3670-2)	15,000	73,000	A	46969 N 98980 E 3690	662	5.40
		May 13	4,100	9,600	A	46830 N 98170 E		

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
6	47302 98508 4013	May 20 (3850-1)	12,300	47,000	S	46840 N 98520 E 3870	484	4.36
		May 26 (simultaneous)						
		(3895-2)	5,900	12,900	S	46750 N	722	9.40
		(3895-2)	13,800	44,900	S	98060 E 3885	722	6.15
		June 4 (3850-3)	3,500	62,200	A	46800 N 98050 E 3870	694	12
		June 5 (3670-3)	3,000	3,000	A	46560 N 99010 E 3690	952	17
		June 6 (3670-4)	3,800	3,800	A	46550 N 99170 E 3690	1053	17
		June 12 (3625-1)	11,700	58,800	A	46380 N 98470 E 3645	993	9.18
		June 22 (3805-1)	1,325	25,700	A	46720 N 98300 E 3825	646	18
		June 22 (3940-1)	12,300	103,300	A	46940 N 98150 E 3960	512	4.62

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
6	47302 98508 4013	June 28 (3805-2)	7,400	62,600	A	46680 N 98000 E 3825	825	9.59
		August 6 (3625-2)	9,475	46,605	A	46400 N 99250 E 3645	1225	13
		August 7 (3625-3)	9,475	44,190	A	46400 N 98990 E 3645	1087	11
		August 17 (3760-1)	14,760	83,125	A	46560 N 98140 E 3780	860	7.08
		August 17 (3670-5)	4,200	4,200	A	46520 N 99420 E 3690	1244	19
		August 23 (3760-2)	5,030	26,810	A	46660 N 98560 E 3780	685	9.66
		August 31 (3760-3)	8,120	65,675	A	46710 N 98370 E 3780	651	7.22
		Sept. 8 (3715-5)	7,850	49,935	A	46500 N 98580 E 3725	855	9.65

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE (ft/lb$^{1/2}$)
6	47302 98508 4013	Sept. 9 (3760-4)	14,830	73,915	A	46680 N 98060 E 3780	801	6.58
		Sept. 18 Simultaneous						
		(3715-6)	2,360	2,360	A	46600 N	759	16
		(3715-7)	5,160	18,275		98525 E	759	11
		(3715-8)	2,745	3,445		3725	759	14
		Oct. 1 (3715-9)	8,840	25,700	S	46490 N 98310 E 3740	879	9.35
		Oct. 2 (3715-10)	5,420	20,300	S	48630 N 98330 E 3740	1367	19
		Oct. 4 (3715-11)	8,313	32,080	S	46560 N 98140 E 3740	872	9.56
		Oct. 9 (3670-6)	6,990	22,260	S	46470 N 98320 E 3690	912	11
		Oct. 17 (3580-1)	12,610	71,606	S	48340 N 98520 E 3600	1117	9.95
		Oct. 20 (3670-10)	10,350	46,930	S	46540 N 98250 E 3690	867	8.52
		Nov. 3 (3580-2)	9,433	15,052	S	46380 N 99100 E 3600	1171	12

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
6	47302 98508 4013	Nov. 5 (3625-5)	4,615	13,492	S	46440 N 98790 E 3645	979	14
		Nov. 13 (3580-3)	5,312	14,877	S	46420 N 99880 E 3600	1683	23
		Nov. 18 (3580-4)	7,520	29,250	S	46260 N 99380 E 3600	1420	16
		Nov. 26 (3625-6)	7,330	29,320	S	46480 N 98510 E 3745	865	10

NOTES:
1. All charge weights calculated in equivalent pounds of AN/FO.
2. S = Slurry, A = AN/FO.
3. All coordinates in feet.

PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
7	47291 97982 4179	March 2 (4000-1)	5,000	9,800	A	47040 N 98100 E 4020	320	4.5
		March 20 (3970-1)	5,100	25,300	A	46970 N 98110 E 3990	394	5.5
		March 23 (3715-1)	8,100	22,400	S	46510 N 98890 E 3735	1277	14
		March 24 (3715-2)	4,500	13,500	A	46470 N 99240 E 3735	1566	23
		April 10 (3670-1)	15,000	39,600	A	46440 N 99320 E 3690	1163	9.5
		April 17 (3715-3)	2,600	2,600	A	46070 N 99090 E 3735	1708	33
		April 24 (3715-4)	3,100	6,200	A	46070 N 99090 E 3735	1708	31
		May 5 (3670-2)	15,000	73,000	A	46969 N 98980 E 3690	1157	9.4
		May 13	4,100	9,600	A	46830 N 98170 E		

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE (ft/lb$^{1/2}$)
7	47291 97982 4179	May 20 (3850-1)	12,300	47,000	S	46840 N 98520 E 3870	767	6.9
		May 26 (simultaneous)						
		(3895-2)	5,900	12,900	S	46750 N	621	8.1
		(3895-2)	13,800	44,900	S	98060 E 3885		5.3 4.4
		June 4 (3850-3)	3,500	62,200	A	46800 N 98050 E 3870	584	9.9
		June 5 (3670-3)	3,000	3,000	A	46560 N 99010 E 3690	1353	25
		June 6 (3670-4)	3,800	3,800	A	46550 N 99170 E 3690	1483	24
		June 12 (3625-1)	11,700	58,800	A	46380 N 98470 E 3645	1163	11
		June 22 (3805-1)	1,325	25,700	A	46720 N 98300 E 3825	743	20
		June 22 (3940-1)	12,300	103,300	A	46940 N 98150 E 3960	447	4.0

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
7	47291 97982 4179	June 28 (3805-2)	7,400	62,600	A	46680 N 98000 E 3825	706	8.2
		August 6 (3625-2)	9,475	46,605	A	46400 N 99250 E 3645	1639	17
		August 7 (3625-3)	9,475	44,190	A	46400 N 98990 E 3645	1447	15
		August 17 (3760-1)	14,760	83,125	A	46560 N 98140 E 3780	848	7.0
		August 17 (3670-5)	4,200	4,200	A	46520 N 99420 E 3690	1703	26
		August 23 (3760-2)	5,030	26,810	A	46660 N 98560 E 3780	944	13
		August 31 (3760-3)	8,120	65,675	A	46710 N 98370 E 3780	639	7.1
		Sept. 8 (3715-5)	7,850	49,935	A	46500 N 98580 E 3725	1091	12

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE (ft/lb$^{1/2}$)
7	47291 97982 4179	Sept. 9 (3760-4)	14,830	73,915	A	46680 N 98060 E 3780	734	6.0
		Sept. 18 Simultaneous						
		(3715-6)	2,360	2,360	A	46600 N	989	20
		(3715-7)	5,160	18,275		98525 E		14 9.8
		(3715-8)	2,745	3,445		3725		19
		Oct. 1 (3715-9)	8,840	25,700	S	46490 N 98310 E 3740	971	10
		Oct. 2 (3715-10)	5,420	20,300	S	48630 N 98330 E 3740	1451	20
		Oct. 4 (3715-11)	8,313	32,080	S	46560 N 98140 E 3740	867	9.5
		Oct. 9 (3670-6)	6,990	22,260	S	46470 N 98320 E 3690	1014	12
		Oct. 17 (3580-1)	12,610	71,606	S	48340 N 98520 E 3600	1313	12
		Oct. 20 (3670-10)	10,350	46,930	S	46540 N 98250 E 3690	935	9.2
		Nov. 3 (3580-2)	9,433	15,052	S	46380 N 99100 E 3600	1554	16

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
7	46291 97982 4179	Nov. 5 (3625-5)	4,615	13,492	S	46440 N 98790 E 3645	1289	19
		Nov. 13 (3580-3)	5,312	14,877	S	46420 N 99880 E 3600	2167	30
		Nov. 18 (3580-4)	7,520	29,250	S	46260 N 99380 E 3600	1831	21
		Nov. 26 (3625-6)	7,330	29,320	S	46480 N 98510 E 3745	1061	12

NOTES:
1. All charge weights calculated in equivalent pounds of AN/FO.
2. S = Slurry, A = AN/FO.
3. All coordinates in feet.

PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE (ft/lb$^{1/2}$)
8	47839 99293 4011	March 2 (4000-1)	5,000	9,800	A	47040 N 98100 E 4020	1436	20
		March 20 (3970-1)	5,100	25,300	A	46970 N 98110 E 3990	1468	21
		March 23 (3715-1)	8,100	22,400	S	46510 N 98890 E 3735	1416	16
		March 24 (3715-2)	4,500	13,500	A	46470 N 99240 E 3735	1398	21
		April 10 (3670-1)	15,000	39,600	A	46440 N 99320 E 3690	1436	12
		April 17 (3715-3)	2,600	2,600	A	46070 N 99090 E 3735	1802	35
		April 24 (3715-4)	3,100	6,200	A	46070 N 99090 E 3735	1802	32
		May 5 (3670-2)	15,000	73,000	A	46969 N 98980 E 3690	979	8.0
		May 13	4,100	9,600	A	46830 N 98170 E		

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE (ft/lb$^{1/2}$)
8	47839 99293 4011	May 20 (3850-1)	12,300	47,000	S	46840 N 98520 E 3870	1271	11
		May 26 (simultaneous)						
		(3895-2)	5,900	12,900	S	46750 N 98060 E 3885	1650	21
		(3895-2)	13,800	44,900	S			14 12
		June 4 (3850-3)	3,500	62,200	A	46800 N 98050 E 3870	1626	27
		June 5 (3670-3)	3,000	3,000	A	46560 N 99010 E 3690	1349	25
		June 6 (3670-4)	3,800	3,800	A	46550 N 99170 E 3690	1334	22
		June 12 (3625-1)	11,700	58,800	A	46380 N 98470 E 3645	1715	16
		June 22 (3805-1)	1,325	25,700	A	46720 N 98300 E 3825	1507	41
		June 22 (3940-1)	12,300	103,300	A	46940 N 98150 E 3960	1455	13

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
8	47839 99293 4011	June 28 (3805-2)	7,400	62,600	A	46680 N 98000 E 3825	1746	20
		August 6 (3625-2)	9,475	46,605	A	46400 N 99250 E 3645	1485	15
		August 7 (3625-3)	9,475	44,190	A	46400 N 98990 E 3645	1515	16
		August 17 (3760-1)	14,760	83,125	A	46560 N 98140 E 3780	1737	14
		August 17 (3670-5)	4,200	4,200	A	46520 N 99420 E 3690	1363	21
		August 23 (3760-2)	5,030	26,810	A	46660 N 98560 E 3780	1407	20
		August 31 (3760-3)	8,120	65,675	A	46710 N 98370 E 3780	1476	16
		Sept. 8 (3715-5)	7,850	49,935	A	46500 N 98580 E 3725	1544	17

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE (ft/lb$^{1/2}$)
8	47839 99293 4011	Sept. 9 (3760-4)	14,830	73,915	A	46680 N 98060 E 3780	1708	14
		Sept. 18 Simultaneous (3715-6) (3715-7) (3715-8)	 2,360 5,160 2,745	 2,360 18,275 3,445	 A	 46600 N 98525 E 3725	 1486	 31 21 28
		Oct. 1 (3715-9)	8,840	25,700	S	46490 N 98310 E 3740	1691	18
		Oct. 2 (3715-10)	5,420	20,300	S	48630 N 98330 E 3740	1275	17
		Oct. 4 (3715-11)	8,313	32,080	S	46560 N 98140 E 3740	1743	19
		Oct. 9 (3670-6)	6,990	22,260	S	46470 N 98320 E 3690	1710	20
		Oct. 17 (3580-1)	12,610	71,606	S	48340 N 98520 E 3600	1009	9.0
		Oct. 20 (3670-10)	10,350	46,930	S	46540 N 98250 E 3690	1697	17
		Nov. 3 (3580-2)	9,433	15,052	S	46380 N 99100 E 3600	1528	16

PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
8	47839 99293 4011	Nov. 5 (3625-5)	4,615	13,492	S	46440 N 98790 E 3645	1531	23
		Nov. 13 (3580-3)	5,312	14,877	S	46420 N 99880 E 3600	1590	22
		Nov. 18 (3580-4)	7,520	29,250	S	46260 N 99380 E 3600	1634	19
		Nov. 26 (3625-6)	7,330	29,320	S	46480 N 98510 E 3745	1591	19

NOTES:
1. All charge weights calculated in equivalent pounds of AN/FO.
2. S = Slurry, A = AN/FO.
3. All coordinates in feet.

PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
9	48075 99325 4166	March 2 (4000-1)	5,000	9,800	A	47040 N 98100 E 4020	1610	23
		March 20 (3970-1)	5,100	25,300	A	46970 N 98110 E 3990	1652	23
		March 23 (3715-1)	8,100	22,400	S	46510 N 98890 E 3735	1681	19
		March 24 (3715-2)	4,500	13,500	A	46470 N 99240 E 3735	1664	25
		April 10 (3670-1)	15,000	39,600	A	46440 N 99320 E 3690	1703	14
		April 17 (3715-3)	2,600	2,600	A	46070 N 99090 E 3735	2064	40
		April 24 (3715-4)	3,100	6,200	A	46070 N 99090 E 3735	2064	37
		May 5 (3670-2)	15,000	73,000	A	46969 N 98980 E 3690	1253	10
		May 13	4,100	9,600	A	46830 N 98170 E		

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE (ft/lb$^{1/2}$)	
9	48075 99325 4166	May 20 (3850-1)	12,300	47,000	S	46840 N 98520 E 3870	1504	14	
		May 26 (simultaneous)							
		(3895-2)	5,900	12,900	S	46750 N 98060 E 3885	1853	24	13
		(3895-2)	13,800	44,900	S			16	
		June 4 (3850-3)	3,500	62,200	A	46800 N 98050 E 3870	1827	31	
		June 5 (3670-3)	3,000	3,000	A	46560 N 99010 E 3690	1619	30	
		June 6 (3670-4)	3,800	3,800	A	46550 N 99170 E 3690	1605	26	
		June 12 (3625-1)	11,700	58,800	A	46380 N 98470 E 3645	1969	18	
		June 22 (3805-1)	1,325	25,700	A	46720 N 98300 E 3825	1733	48	
		June 22 (3940-1)	12,300	103,300	A	46940 N 98150 E 3960	1647	15	

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
9	48075 99325 4166	June 28 (3805-2)	7,400	62,600	A	46680 N 98000 E 3825	1954	23
		August 6 (3625-2)	9,475	46,605	A	46400 N 99250 E 3645	1756	18
		August 7 (3625-3)	9,475	44,190	A	46400 N 98990 E 3645	1786	18
		August 17 (3760-1)	14,760	83,125	A	46560 N 98140 E 3780	1962	16
		August 17 (3670-5)	4,200	4,200	A	46520 N 99420 E 3690	1629	25
		August 23 (3760-2)	5,030	26,810	A	46660 N 98560 E 3780	1654	23
		August 31 (3760-3)	8,120	65,675	A	46710 N 98370 E 3780	1710	19
		Sept. 8 (3715-5)	7,850	49,935	A	46500 N 98580 E 3725	1797	20

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE (ft/lb$^{1/2}$)
9	48075 99325 4166	Sept. 9 (3760-4)	14,830	73,915	A	46680 N 98060 E 3780	1922	16
		Sept. 18 Simultaneous						
		(3715-6)	2,360	2,360	A	46600 N	1735	36
		(3715-7)	5,160	18,275		98525 E		24 17
		(3715-8)	2,745	3,445		3725		33
		Oct. 1 (3715-9)	8,840	25,700	S	46490 N 98310 E 3740	1930	21
		Oct. 2 (3715-10)	5,420	20,300	S	48630 N 98330 E 3740	1216	17
		Oct. 4 (3715-11)	8,313	32,080	S	46560 N 98140 E 3740	1970	22
		Oct. 9 (3670-6)	6,990	22,260	S	46470 N 98320 E 3690	1953	23
		Oct. 17 (3580-1)	12,610	71,606	S	48340 N 98520 E 3600	1019	9.1
		Oct. 20 (3670-10)	10,350	46,930	S	46540 N 98250 E 3690	1934	19
		Nov. 3 (3580-2)	9,433	15,052	S	46380 N 99100 E 3600	1801	19

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
9	48075 99325 4166	Nov. 5 (3625-5)	4,615	13,492	S	46440 N 98790 E 3645	1797	26
		Nov. 13 (3580-3)	5,312	14,877	S	46420 N 99880 E 3600	1835	25
		Nov. 18 (3580-4)	7,520	29,250	S	46260 N 99380 E 3600	1902	22
		Nov. 26 (3625-6)	7,330	29,320	S	46480 N 98510 E 3745	1840	21

NOTES:
1. All charge weights calculated in equivalent pounds of AN/FO.
2. S = Slurry, A = AN/FO.
3. All coordinates in feet.

PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
10	48356 99298 4369	March 2 (4000-1)	5,000	9,800	A	47040 N 98100 E 4020	1814	26
		March 20 (3970-1)	5,100	25,300	A	46970 N 98110 E 3990	1864	26
		March 23 (3715-1)	8,100	22,400	S	46510 N 98890 E 3735	1994	22
		March 24 (3715-2)	4,500	13,500	A	46470 N 99240 E 3735	1991	30
		April 10 (3670-1)	15,000	39,600	A	46440 N 99320 E 3690	2033	17
		April 17 (3715-3)	2,600	2,600	A	46070 N 99090 E 3735	2381	47
		April 24 (3715-4)	3,100	6,200	A	46070 N 99090 E 3735	2381	43
		May 5 (3670-2)	15,000	73,000	A	46969 N 98980 E 3690	1577	13
		May 13	4,100	9,600	A	46830 N 98170 E		

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE (ft/lb$^{1/2}$)
10	48356 99298 4369	May 20 (3850-1)	12,300	47,000	S	46840 N 98520 E 3870	1776	16
		May 26 (simultaneous)						
		(3895-2)	5,900	12,900	S	46750 N 98060 E 3885	2085	27
		(3895-2)	13,800	44,900	S			18 15
		June 4 (3850-3)	3,500	62,200	A	46800 N 98050 E 3870	2056	35
		June 5 (3670-3)	3,000	3,000	A	46560 N 99010 E 3690	1942	35
		June 6 (3670-4)	3,800	3,800	A	46550 N 99170 E 3690	1934	31
		June 12 (3625-1)	11,700	58,800	A	46380 N 98470 E 3645	2261	21
		June 22 (3805-1)	1,325	25,700	A	46720 N 98300 E 3825	1992	55
		June 22 (3940-1)	12,300	103,300	A	46940 N 98150 E 3960	1868	17

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
10	48356 99298 4369	June 28 (3805-2)	7,400	62,600	A	46680 N 98000 E 3825	2189	25
		August 6 (3625-2)	9,475	46,605	A	46400 N 99250 E 3645	2086	21
		August 7 (3625-3)	9,475	44,190	A	46400 N 98990 E 3645	2108	22
		August 17 (3760-1)	14,760	83,125	A	46560 N 98140 E 3780	2217	18
		August 17 (3670-5)	4,200	4,200	A	46520 N 99420 E 3690	1961	30
		August 23 (3760-2)	5,030	26,810	A	46660 N 98560 E 3780	1941	27
		August 31 (3760-3)	8,120	65,675	A	46710 N 98370 E 3780	1979	22
		Sept. 8 (3715-5)	7,850	49,935	A	46500 N 98580 E 3725	2092	24

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE (ft/lb$^{1/2}$)
10	48356 99298 4369	Sept. 9 (3760-4)	14,830	73,915	A	46680 N 98060 E 3780	2165	18
		Sept. 18 Simultaneous (3715-6) (3715-7) (3715-8)	 2,360 5,160 2,745	 2,360 18,275 3,445	 A	 46600 N 98525 E 3725	 2024	 42 28 39 20
		Oct. 1 (3715-9)	8,840	25,700	S	46490 N 98310 E 3740	2203	23
		Oct. 2 (3715-10)	5,420	20,300	S	48630 N 98330 E 3740	1186	16
		Oct. 4 (3715-11)	8,313	32,080	S	46560 N 98140 E 3740	2223	24
		Oct. 9 (3670-6)	6,990	22,260	S	46470 N 98320 E 3690	2230	27
		Oct. 17 (3580-1)	12,610	71,606	S	48340 N 98520 E 3600	1094	9.7
		Oct. 20 (3670-10)	10,350	46,930	S	46540 N 98250 E 3690	2204	22
		Nov. 3 (3580-2)	9,433	15,052	S	46380 N 99100 E 3600	2130	22

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
10	48356 99298 4369	Nov. 5 (3625-5)	4,615	13,492	S	46440 N 98790 E 3645	2110	31
		Nov. 13 (3580-3)	5,312	14,877	S	46420 N 99880 E 3600	2163	30
		Nov. 18 (3580-4)	7,520	29,250	S	46260 N 99380 E 3600	2234	26
		Nov. 26 (3625-6)	7,330	29,320	S	46480 N 98510 E 3745	2128	25

NOTES:
1. All charge weights calculated in equivalent pounds of AN/FO.
2. S = Slurry, A = AN/FO.
3. All coordinates in feet.

PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
11	48466 99288 4449	March 2 (4000-1)	5,000	9,800	A	47040 N 98100 E 4020	1905	27
		March 20 (3970-1)	5,100	25,300	A	46970 N 98110 E 3990	1736	24
		March 23 (3715-1)	8,100	22,400	S	46510 N 98890 E 3735	2120	24
		March 24 (3715-2)	4,500	13,500	A	46470 N 99240 E 3735	2120	32
		April 10 (3670-1)	15,000	39,600	A	46440 N 99320 E 3690	2164	18
		April 17 (3715-3)	2,600	2,600	A	46070 N 99090 E 3735	2508	49
		April 24 (3715-4)	3,100	6,200	A	46070 N 99090 E 3735	2508	45
		May 5 (3670-2)	15,000	73,000	A	46969 N 98980 E 3690	1706	14
		May 13	4,100	9,600	A	46830 N 98170 E		

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE (ft/lb$^{1/2}$)	
11	48466 99288 4449	May 20 (3850-1)	12,300	47,000	S	46840 N 98520 E 3870	1889	17	
		May 26 (simultaneous)							
		(3895-2)	5,900	12,900	S	46750 N 98060 E 3885	2184	28	
		(3895-2)	13,800	44,900	S			19	16
		June 4 (3850-3)	3,500	62,200	A	46800 N 98050 E 3870	2155	36	
		June 5 (3670-3)	3,000	3,000	A	46560 N 99010 E 3690	2070	38	
		June 6 (3670-4)	3,800	3,800	A	46550 N 99170 E 3690	2064	33	
		June 12 (3625-1)	11,700	58,800	A	46380 N 98470 E 3645	2381	22	
		June 22 (3805-1)	1,325	25,700	A	46720 N 98300 E 3825	2101	58	
		June 22 (3940-1)	12,300	103,300	A	46940 N 98150 E 3960	1965	18	

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
11	48466 99288 4449	June 28 (3805-2)	7,400	62,600	A	46680 N 98000 E 3825	2289	27
		August 6 (3625-2)	9,475	46,605	A	46400 N 99250 E 3645	2217	23
		August 7 (3625-3)	9,475	44,190	A	46400 N 98990 E 3645	2237	23
		August 17 (3760-1)	14,760	83,125	A	46560 N 98140 E 3780	2323	19
		August 17 (3670-5)	4,200	4,200	A	46520 N 99420 E 3690	2093	32
		August 23 (3760-2)	5,030	26,810	A	46660 N 98560 E 3780	2059	29
		August 31 (3760-3)	8,120	65,675	A	46710 N 98370 E 3780	2091	23
		Sept. 8 (3715-5)	7,850	49,935	A	46500 N 98580 E 3725	2211	25

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE (ft/lb$^{1/2}$)
11	48466 99288 4449	Sept. 9 (3760-4)	14,830	73,915	A	46680 N 98060 E 3780	2268	19
		Sept. 18 Simultaneous						
		(3715-6)	2,360	2,360	A	46600 N	2142	44
		(3715-7)	5,160	18,275		98525 E		30 21
		(3715-8)	2,745	3,445		3725		41
		Oct. 1 (3715-9)	8,840	25,700	S	46490 N 98310 E 3740	2316	25
		Oct. 2 (3715-10)	5,420	20,300	S	48630 N 98330 E 3740	1203	16
		Oct. 4 (3715-11)	8,313	32,080	S	46560 N 98140 E 3740	2335	26
		Oct. 9 (3670-6)	6,990	22,260	S	46470 N 98320 E 3690	2345	28
		Oct. 17 (3580-1)	12,610	71,606	S	48340 N 98520 E 3600	1152	10
		Oct. 20 (3670-10)	10,350	46,930	S	46540 N 98250 E 3690	2316	23
		Nov. 3 (3580-2)	9,433	15,052	S	46380 N 99100 E 3600	2260	23

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
11	48466 99288 4449	Nov. 5 (3625-5)	4,615	13,492	S	46440 N 98790 E 3645	2236	33
		Nov. 13 (3580-3)	5,312	14,877	S	46420 N 99880 E 3600	2293	31
		Nov. 18 (3580-4)	7,520	29,250	S	46260 N 99380 E 3600	2366	27
		Nov. 26 (3625-6)	7,330	29,320	S	46480 N 98510 E 3745	2246	26

NOTES:
1. All charge weights calculated in equivalent pounds of AN/FO.
2. S = Slurry, A = AN/FO.
3. All coordinates in feet.

PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
12	48535 99298 4498	March 2 (4000-1)	5,000	9,800	A	47040 N 98100 E 4020	1975	28
		March 20 (3970-1)	5,100	25,300	A	46970 N 98110 E 3990	2029	28
		March 23 (3715-1)	8,100	22,400	S	46510 N 98890 E 3735	2202	24
		March 24 (3715-2)	4,500	13,500	A	46470 N 99240 E 3735	3154	47
		April 10 (3670-1)	15,000	39,600	A	46440 N 99320 E 3690	2246	18
		April 17 (3715-3)	2,600	2,600	A	46070 N 99090 E 3735	2589	51
		April 24 (3715-4)	3,100	6,200	A	46070 N 99090 E 3735	2589	46
		May 5 (3670-2)	15,000	73,000	A	46969 N 98980 E 3690	1791	15
		May 13	4,100	9,600	A	46830 N 98170 E		

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE (ft/lb$^{1/2}$)
12	48535 99298 4498	May 20 (3850-1)	12,300	47,000	S	46840 N 98520 E 3870	1968	18
		May 26 (simultaneous)						
		(3895-2)	5,900	12,900	S	46750 N 98060 E 3885	2257	29
		(3895-2)	13,800	44,900	S			19 16
		June 4 (3850-3)	3,500	62,200	A	46800 N 98050 E 3870	2228	38
		June 5 (3670-3)	3,000	3,000	A	46560 N 99010 E 3690	2153	39
		June 6 (3670-4)	3,800	3,800	A	46550 N 99170 E 3690	2147	35
		June 12 (3625-1)	11,700	58,800	A	46380 N 98470 E 3645	2461	23
		June 22 (3805-1)	1,325	25,700	A	46720 N 98300 E 3825	2178	60
		June 22 (3940-1)	12,300	103,300	A	46940 N 98150 E 3960	2037	18

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
12	48535 99298 4498	June 28 (3805-2)	7,400	62,600	A	46680 N 98000 E 3825	2362	27
		August 6 (3625-2)	9,475	46,605	A	46400 N 99250 E 3645	2300	24
		August 7 (3625-3)	9,475	44,190	A	46400 N 98990 E 3645	2320	24
		August 17 (3760-1)	14,760	83,125	A	46560 N 98140 E 3780	2399	20
		August 17 (3670-5)	4,200	4,200	A	46520 N 99420 E 3690	2174	34
		August 23 (3760-2)	5,030	26,810	A	46660 N 98560 E 3780	2139	30
		August 31 (3760-3)	8,120	65,675	A	46710 N 98370 E 3780	2170	24
		Sept. 8 (3715-5)	7,850	49,935	A	46500 N 98580 E 3725	2292	26

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE (ft/lb$^{1/2}$)
12	48535 99298 4498	Sept. 9 (3760-4)	14,830	73,915	A	46680 N 98060 E 3780	2343	19
		Sept. 18 Simultaneous						
		(3715-6)	2,360	2,360	A	46600 N	2222	46
		(3715-7)	5,160	18,275		98525 E		31 22
		(3715-8)	2,745	3,445		3725		42
		Oct. 1 (3715-9)	8,840	25,700	S	46490 N 98310 E 3740	2394	25
		Oct. 2 (3715-10)	5,420	20,300	S	48630 N 98330 E 3740	1233	17
		Oct. 4 (3715-11)	8,313	32,080	S	46560 N 98140 E 3740	2412	26
		Oct. 9 (3670-6)	6,990	22,260	S	46470 N 98320 E 3690	2424	29
		Oct. 17 (3580-1)	12,610	71,606	S	48340 N 98520 E 3600	1204	11
		Oct. 20 (3670-10)	10,350	46,930	S	46540 N 98250 E 3690	2394	24
		Nov. 3 (3580-2)	9,433	15,052	S	46380 N 99100 E 3600	2343	24

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PRISM	PRISM COORDINATES	DATE (BLAST NO.)	MAXIMUM[1] CHARGE WEIGHT PER DELAY (lbs)	TOTAL[1] CHARGE WEIGHT (lbs)	TYPE OF[2] EXPLOSIVE	COORDINATES[3] OF CENTER OF BLAST (Northing, Easting, Elevation)	SLOPED DISTANCE (ft)	SCALED DISTANCE ($ft/lb^{1/2}$)
12	48535 99298 4498	Nov. 5 (3625-5)	4,615	13,492	S	46440 N 98790 E 3645	2318	34
		Nov. 13 (3580-3)	5,312	14,877	S	46420 N 99880 E 3600	2370	33
		Nov. 18 (3580-4)	7,520	29,250	S	46260 N 99380 E 3600	2447	28
		Nov. 26 (3625-6)	7,330	29,320	S	46480 N 98510 E 3745	2326	27

NOTES:

1. All charge weights calculated in equivalent pounds of AN/FO.
2. S = Slurry, A = AN/FO.
3. All coordinates in feet.

APPENDIX III

SURVEY PRISM MONITORING DATA

SUMMARY FOR PRISM 1

DATA	TIME	NORTH	EAST	ELEV
870302	1505	46091.168	101248.269	3530.577
870302	1552	46091.178	101248.264	3530.526
870302	1622	46091.157	101248.266	3530.546
870302	1652	46091.157	101248.264	3530.515
870303	1720	46091.158	101248.275	3530.535
870305	1130	46091.157	101248.268	3530.567
870306	1100	46091.219	101248.258	3530.508
870311	1330	46091.147	101248.265	3530.576
870319	1527	46091.147	101248.271	3530.597
870320	1420	46091.169	101248.270	3530.577
870320	1440	46071.147	101248.270	3530.587
870320	1515	46091.157	101248.270	3530.517
870320	1535	46091.147	101248.270	3530.587
870320	1555	46091.147	101248.270	3530.587
870323	1640	46091.167	101248.248	3530.568
870323	1705	46091.136	101248.250	3530.579
870323	1730	46091.146	101248.249	3530.568
870323	1800	46091.157	101248.258	3530.537
870323	1825	46091.147	101248.261	3530.598
870324	1400	46091.157	101248.257	3530.527
870324	1620	46071.188	101248.265	3530.546
870324	1645	46091.157	101248.258	3530.537
870324	1710	46091.178	101248.267	3530.567
870402	1225	46091.188	101248.255	3530.547
870408	1400	46091.178	101248.270	3530.597
870410	1648	46091.168	101248.269	3530.463
870410	1800	46091.183	101248.269	3530.474
870423	1113	46091.160	101248.267	3530.556
870429	1230	46091.105	101248.251	3530.465
870505	1240	46091.168	101248.271	3530.731
870505	1823	46091.137	101248.260	3530.578
870505	1848	46091.126	101248.253	3530.471
870505	1913	46091.168	101248.269	3530.577
870505	1938	46091.139	101248.258	3530.578
870513	1502	46091.188	101248.264	3530.536
870513	1807	46091.167	101248.261	3530.485
870513	1827	46091.147	101248.268	3530.556
870513	1849	46091.167	101248.256	3530.423
870513	1911	46091.167	101248.262	3530.495
870520	1320	46091.178	101248.267	3530.443
870520	1628	46091.157	101248.271	3530.484
870520	1645	46091.127	101248.278	3530.556
870520	1700	46091.127	101248.274	3530.504
870520	1715	46091.137	101248.278	3530.479
870526	1306	46091.157	101248.264	3530.515
870526	1642	46091.156	101248.243	3530.383
870526	1708	46091.147	101248.257	3530.433
870526	1730	46091.147	101248.270	3530.507
870526	1750	46091.147	101248.262	3530.495
870604	1350	46091.137	101248.269	3530.567
870604	1835	46091.188	101248.257	3530.567
870604	1720	46091.116	101248.264	3530.619
870612	930	46091.167	101248.257	3530.557
870612	1700	46091.126	101248.250	3530.557
870612	1745	46091.168	101248.267	3530.556
870622	1030	46091.168	101248.285	3530.534
870622	1145	46091.168	101248.274	3530.525
870622	1228	46091.148	101248.305	3530.552
870622	1300	46091.178	101248.268	3530.577
870622	1335	46091.158	101248.279	3530.576
870622	1600	46091.209	101248.267	3530.577
870622	1640	46091.160	101248.266	3530.546
870622	1710	46091.157	101248.267	3530.556
870627	1650	46091.178	101248.264	3530.412

DATA	TIME	NORTH	EAST	ELEV
870627	1750	46091.178	101248.265	3530.422
870627	1820	46091.188	101248.252	3530.372
870627	1842	46091.178	101248.261	3530.495
870627	1907	46091.178	101248.267	3530.567
870806	1245	46091.208	101248.259	3530.485
870806	1820	46091.208	101248.254	3530.423
870806	1845	46091.157	101249.253	3530.506
870806	1915	46091.167	101248.259	3530.568
870806	1940	46091.137	101248.268	3530.556
870806	2005	46091.127	101248.270	3530.577
870807	1400	46091.176	101248.228	3530.570
870807	1615	46091.188	101248.255	3530.547
870807	1655	46091.177	101248.241	3530.497
870807	1725	46091.157	101248.256	3530.537
870807	1755	46091.177	101248.258	3530.475
870817	1015	46091.169	101248.267	3530.556
870817	1418	46091.200	101248.255	3530.423
870817	1455	46091.160	101248.286	3530.544
870817	1520	46091.159	101248.268	3530.443
870823	1320	46091.148	101248.252	3530.476
870823	1440	46091.139	101248.279	3530.566
870823	1520	46091.159	101248.275	3530.525
870823	1550	46091.149	101248.262	3530.493
870823	1620	46091.149	101248.264	3530.515
870831	1130	46091.189	101248.240	3530.363
870831	1643	46091.139	101248.256	3530.433
870831	1710	46091.189	101248.239	3530.476
870831	1742	46091.211	101248.276	3530.506
870908	1145	46091.199	101248.246	3530.444
870908	1700	46091.179	101248.255	3530.537
870908	1744	46091.179	101248.239	3530.466
870908	1809	46091.200	101248.256	3530.557
870908	1836	46091.200	101248.252	3530.516
870909	1505	46091.149	101248.267	3530.546
870909	1805	46091.169	101248.257	3530.557
870909	1840	46091.159	101248.258	3530.567
870909	1940	46091.190	101248.258	3530.578
870915	1235	46091.180	101248.275	3530.535
870915	1420	46091.180	101248.266	3530.556
870916	1035	46091.169	101248.263	3530.505
870917	1045	46091.190	101248.273	3530.525
870917	1915	46091.159	101248.256	3530.547
870918	935	46091.178	101248.273	3530.628
870918	1510	46091.190	101248.264	3530.526
870918	1610	46091.159	101248.265	3530.536
870919	900	46091.179	101248.256	3530.557
870920	1025	46091.180	101248.268	3530.577
870921	1010	46091.210	101248.266	3530.567
870922	930	46091.189	101248.254	3530.537
870923	815	46091.210	101248.256	3530.567
870924	845	46091.179	101248.262	3530.619
870924	1430	46091.179	101248.255	3530.537
870925	920	46091.189	101248.246	3530.558
870925	1430	46091.200	101248.254	3530.537
870926	850	46091.189	101248.248	3530.579
870926	1440	46091.169	101248.249	3530.579
870927	920	46091.200	101248.254	3530.537
870928	1350	46091.159	101248.256	3530.547
870929	820	46091.159	101248.261	3530.608
870930	925	46091.199	101248.246	3530.558
871001	1310	46091.189	101248.255	3530.547
871001	1605	46091.189	101248.244	3530.527
871001	1717	46091.189	101248.245	3530.548

SUMMARY OF DISPLACEMENT MONITORING DATA

MARCH - SEPTEMBER / 1987

SUMMARY FOR PRISM 1

DATE	TIME	NORTH	EAST	ELEV
871113	1435	46091.179	101248.248	3538.579
871114	935	46091.169	101248.248	3538.568
871116	1145	46091.180	101248.269	3538.587
871117	1340	46091.148	101248.247	3538.548
871118	1505	46091.169	101248.257	3538.557
871118	1701	46091.220	101248.246	3538.568
871119	1010	46091.190	101248.258	3538.578
871120	1255	46091.189	101248.249	3538.589
871121	940	46091.199	101248.246	3538.558
871123	1320	46091.179	101248.259	3538.588
871124	1520	46091.199	101248.247	3538.568
871125	1250	46091.189	101248.254	3538.537
871126	1412	46091.200	101248.253	3538.526
871126	1640	46091.159	101248.260	3538.588
871127	1109	46091.199	101248.245	3538.548
871127	1530	46091.168	101248.239	3538.579
871128	1309	46091.210	101248.261	3538.585
871129	1316	46091.169	101248.252	3538.496
871129	1442	46091.179	101248.243	3538.517
871130	1230	46091.220	101248.246	3538.568
871201	1345	46091.210	101248.243	3538.527
871204	1150	46091.180	101248.266	3538.546
871204	1522	46091.169	101248.257	3538.557
871205	1430	46091.179	101248.257	3538.567
871206	1320	46091.169	101248.249	3538.589
871207	1025	46091.179	101248.240	3538.600
871208	1200	46091.169	101248.248	3538.568
871210	1110	46091.169	101248.248	3538.568
871211	1000	46091.148	101248.249	3538.579
871212	1245	46091.169	101248.255	3538.537
871213	1145	46091.200	101248.266	3538.556
871214	1525	46091.179	101248.247	3538.558
871215	1150	46091.179	101248.245	3538.538
871216	1130	46091.179	101248.256	3538.547
871217	1310	46091.179	101248.244	3538.527
871219	1330	46091.169	101248.248	3538.568
871220	1350	46091.179	101248.255	3538.537
871220	1445	46091.189	101248.248	3538.579
871221	1510	46091.179	101248.246	3538.548
871223	1045	46091.179	101248.248	3538.579
871228	1130	46091.158	101248.249	3538.579
871230	1150	46091.179	101248.247	3538.558

DATE	TIME	NORTH	EAST	ELEV
871002	1720	46091.179	101248.254	3538.526
871002	1815	46091.169	101248.258	3538.567
871003	1300	46091.180	101248.282	3538.583
871004	1442	46091.200	101248.273	3538.525
871004	1630	46091.179	101248.256	3538.547
871004	1710	46091.159	101248.256	3538.547
871006	1100	46091.210	101248.261	3538.585
871008	1000	46091.179	101248.256	3538.547
871009	1210	46091.199	101248.246	3538.434
871009	1545	46091.148	101248.246	3538.538
871009	1640	46091.179	101248.244	3538.527
871014	1350	46091.179	101248.256	3538.557
871017	1420	46091.199	101248.242	3538.517
871017	1515	46091.189	101248.243	3538.517
871017	1615	46091.169	101248.254	3538.526
871020	1622	46091.179	101248.247	3538.568
871020	1810	46091.199	101248.248	3538.589
871023	1410	46091.189	101248.244	3538.527
871025	1245	46091.189	101248.245	3538.548
871026	1025	46091.179	101248.256	3538.547
871027	1145	46091.210	101248.255	3538.557
871028	831	46091.179	101248.237	3538.569
871029	916	46091.128	101248.264	3538.629
871030	945	46091.179	101248.259	3538.588
871031	935	46091.128	101248.257	3538.537
871101	840	46091.158	101248.248	3538.568
871102	1210	46091.200	101248.256	3538.557
871103	1515	46091.189	101248.246	3538.558
871103	1615	46091.148	101248.244	3538.517
871103	1710	46091.138	101248.248	3538.558
871104	1030	46091.179	101248.258	3538.578
871104	1410	46091.169	101248.257	3538.557
871105	1145	46091.220	101248.247	3538.579
871105	1330	46091.179	101248.239	3538.590
871105	1415	46091.179	101248.246	3538.548
871106	1330	46091.199	101248.226	3538.568
871107	1010	46091.169	101248.257	3538.557
871108	1125	46091.189	101248.255	3538.547
871109	1130	46091.158	101248.241	3538.600
871110	1455	46091.168	101248.236	3538.549
871112	1125	46091.190	101248.256	3538.557
871113	1350	46091.179	101248.247	3538.558

SUMMARY OF DISPLACEMENT MONITORING DATA
OCTOBER TO DECEMBER/1987

SUMMARY FOR PRISM 2

DATA	TIME	NORTH	EAST	ELEV
870302	1505	48092.360	98170.005	4524.961
870302	1552	48092.346	98170.048	4525.052
870302	1622	48092.326	98170.070	4525.140
870302	1655	48092.358	98170.092	4525.085
870302	1720	48092.347	98170.060	4525.074
870305	1100	48092.325	98170.095	4525.111
870306	1100	48092.256	98170.029	4525.149
870311	1330	48092.308	98170.042	4525.063
870319	1527	48092.121	98170.166	4524.972
870320	1420	48092.116	98170.156	4524.972
870320	1440	48092.125	98170.176	4524.972
870320	1515	48092.128	98170.162	4524.949
870320	1535	48092.129	98170.174	4524.960
870320	1555	48092.129	98170.174	4524.960
870323	1640	48092.018	98170.275	4524.884
870323	1705	48091.999	98170.234	4524.934
870323	1730	48092.002	98170.233	4524.935
870323	1800	48092.012	98170.216	4524.871
870323	1825	48091.997	98170.248	4524.907
870324	1400	48091.930	98170.291	4524.891
870324	1620	48091.929	98170.328	4524.847
870324	1645	48091.950	98170.318	4524.781
870324	1710	48091.929	98170.341	4524.833
870402	1225	48091.671	98170.412	4524.739
870408	1400	48091.745	98170.377	4524.488
870410	1648	48091.760	98170.444	4524.550
870410	1800	48091.663	98170.404	4524.758
870423	1113	48091.628	98170.395	4524.502
870429	1230	48089.078	98168.429	4524.511
870505	1240	48089.027	98168.257	4524.408
870505	1823	48089.092	98168.325	4524.293
870505	1848	48089.139	98168.389	4524.249
870505	1913	48089.030	98168.342	4524.471
870505	1938	48089.024	98168.308	4524.474
870513	1502	48089.056	98168.354	4524.390
870513	1807	48089.038	98168.399	4524.420
870513	1827	48089.023	98168.321	4524.434
870513	1849	48089.063	98168.388	4524.412
870513	1911	48089.055	98168.355	4524.364
870520	1320	48088.996	98168.333	4524.486
870520	1628	48089.029	98168.440	4524.530
870520	1645	48089.071	98168.371	4524.342
870520	1700	48089.064	98168.375	4524.364
870520	1715	48088.994	98168.273	4524.420
870526	1306	48089.056	98168.378	4524.299
870526	1642	48089.103	98168.393	4524.199
870526	1708	48089.065	98168.387	4524.288
870526	1730	48089.025	98168.368	4524.365
870526	1750	48089.033	98168.365	4524.343
870604	1350	48089.006	98168.451	4524.422
870604	1835	48088.980	98168.389	4524.385
870604	1920	48089.020	98168.456	4524.363
870612	930	48088.978	98168.427	4524.316
870612	1700	48089.039	98168.374	4524.369
870622	1030	48089.005	98168.439	4524.323
870622	1145	48089.014	98168.427	4524.312
870622	1220	48089.013	98168.447	4524.312

DATA	TIME	NORTH	EAST	ELEV
870622	1300	48089.013	98168.447	4524.312
870622	1335	48088.976	98168.453	4524.324
870622	1600	48087.022	98168.480	4524.297
870622	1640	48088.988	98168.447	4524.316
870622	1710	48088.990	98168.470	4524.338
870627	1650	48088.986	98168.472	4524.349
870627	1750	48088.963	98168.459	4524.394
870627	1820	48088.977	98168.516	4524.346
870627	1842	48089.021	98168.444	4524.228
870627	1907	48088.968	98168.432	4524.349
870722	730	48088.927	98168.449	4524.234
870729	930	48088.894	98168.354	4524.175
870804	900	48089.003	98168.489	4524.229
870806	1245	48088.977	98168.538	4524.124
870806	1820	48088.922	98168.527	4524.220
870806	1845	48088.910	98168.557	4524.287
870806	1915	48088.910	98168.520	4524.243
870806	1940	48088.912	98168.543	4524.265
870806	2005	48088.915	98168.530	4524.243
870807	1400	48088.905	98168.547	4524.199
870807	1615	48088.920	98168.552	4524.166
870807	1655	48088.932	98168.546	4524.158
870807	1725	48088.942	98168.554	4524.173
870807	1755	48088.927	98168.512	4524.162
870817	1015	48088.941	98168.626	4524.112
870817	1418	48088.930	98168.545	4524.045
870817	1455	48088.963	98168.505	4523.912
870817	1520	48088.876	98168.571	4524.211
870823	1320	48088.877	98168.582	4524.073
870823	1440	48088.887	98168.590	4524.087
870823	1520	48088.920	98168.623	4524.043
870823	1550	48088.906	98168.593	4524.043
870823	1620	48088.890	98168.540	4524.021
870831	1130	48088.928	98168.632	4523.794
870831	1643	48088.866	98168.636	4523.986
870831	1710	48088.891	98168.637	4523.894
870831	1742	48088.882	98168.567	4523.864
870908	1145	48088.847	98168.731	4523.948
870908	1700	48088.834	98168.688	4523.892
870908	1744	48088.852	98168.704	4523.896
870908	1807	48088.856	98168.666	4523.840
870908	1836	48088.858	98168.689	4523.863
870909	1505	48088.907	98168.666	4523.770
870909	1805	48088.849	98168.717	4523.918
870909	1840	48088.854	98168.728	4523.918
870909	1940	48088.833	98168.701	4523.940
870915	1235	48088.798	98168.668	4523.871
870915	1420	48088.798	98168.668	4523.871
870918	835	48088.535	98168.840	4523.760
870918	1510	48088.803	98168.715	4523.853
870918	1610	48088.799	98168.729	4523.850
870921	1010	48088.754	98168.689	4523.829
870923	815	48088.748	98168.732	4523.855
870925	1430	48088.715	98168.682	4523.830
871001	1310	48088.749	98168.825	4523.794
871001	1605	48088.763	98168.819	4523.758
871001	1717	48088.749	98168.789	4523.758

SUMMARY OF DISPLACEMENT MONITORING DATA

MARCH-SEPTEMBER/1987

SUMMARY FOR PRISM 2

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DATE	TIME	NORTH	EAST	ELEV
[illegible]	1545	48088.736	[illegible]	4523.747
871008	1700	47976.[illegible]	97957.686	4523.747
871008	1815	47[illegible]	97957.696	4523.747
871023	1300	47[illegible]	98168.806	4523.821
871004	1442	[illegible].716	98168.780	4523.765
871004	1522	48088.724	98168.788	4523.754
871004	1710	48088.736	98168.795	4523.732
871005	1210	48088.654	98168.772	4523.734
871005	1545	48088.783	98168.[illegible]	4523.671
[illegible]	1640	48088.738	98168.[illegible]	4523.693
871014	1350	48088.689	98168.841	4523.698
871017	1420	48088.[illegible]	98168.786	4523.643
871017	1515	48088.[illegible]	98168.815	4523.632
871017	1615	48088.671	98168.850	4523.665
871020	1620	48088.631	98168.832	4523.655
871020	1810	48088.632	98168.806	4523.622
871023	1412	48088.651	98168.932	4523.634
871025	1245	48088.594	98168.[illegible]	4523.667
871031	1025	48088.625	98168.[illegible]	4523.681
871028	831	48088.609	98168.[illegible]	4523.685
871029	916	48088.549	98168.933	4523.583
871103	1515	48088.[illegible]	98168.896	4523.547
871103	1615	48088.[illegible]	98168.886	4523.547
871103	1712	48088.606	98168.953	4523.568
871105	1145	48088.590	98168.924	4523.541
871105	1330	48088.584	98168.939	4523.574
871105	1415	48088.579	98168.917	4523.563
871110	1350	48088.583	98168.998	4523.516
871110	1435	48088.540	98168.983	4523.549
871116	1505	48088.551	98168.967	4523.484
871126	1412	48088.543	98169.020	4523.448
871126	1640	48088.542	98169.020	4523.448
871129	1316	48088.[illegible]	98168.971	4523.464
871129	1442	48088.531	98169.049	4523.453
871210	1017	48088.467	98169.030	4523.385
871230	1351	48088.425	98169.001	4523.338
871230	1445	48088.482	98169.080	4523.294
880113	1255	48088.375	98169.112	4523.268

SUMMARY OF DISPLACEMENT MONITORING DATA
OCTOBER TO DECEMBER/1987

SUMMARY FOR PRISM 3

DATA	TIME	NORTH	EAST	ELEV
870302	1505	47935.763	98250.313	4408.576
870302	1552	47935.771	98250.400	4408.634
870302	1622	47935.740	98250.426	4408.701
870302	1655	47935.741	98250.403	4408.750
870302	1720	47935.765	98250.414	4408.699
870305	1100	47935.775	98250.432	4408.631
870306	1100	47935.857	98250.351	4408.755
870311	1330	47935.682	98250.385	4408.666
870319	1527	47935.549	98250.480	4408.579
870320	1420	47935.539	98250.474	4408.599
870320	1440	47935.554	98250.466	4408.548
870320	1515	47935.548	98250.503	4408.610
870320	1535	47935.531	98250.466	4408.618
870320	1555	47935.531	98250.466	4408.610
870323	1640	47935.514	98250.519	4408.563
870323	1705	47935.503	98250.501	4408.573
870323	1730	47935.490	98250.485	4408.617
870323	1800	47935.504	98250.512	4408.584
870323	1825	47935.507	98250.488	4408.576
870324	1400	47935.500	98250.503	4408.584
870324	1620	47935.526	98250.536	4408.553
870324	1645	47935.522	98250.526	4408.553
870324	1710	47935.511	98250.520	4408.573
870402	1225	47935.361	98250.510	4408.495
870604	1350	47935.632	98250.656	4408.477
870604	1835	47935.576	98250.580	4408.505
870604	1920	47935.611	98250.632	4408.474
870612	930	47935.567	98250.576	4408.421
870612	1700	47935.550	98250.558	4408.421
870612	1745	47935.541	98250.563	4408.451
870622	1030	47935.518	98250.562	4408.387
870622	1145	47935.541	98250.653	4408.405
870622	1220	47935.545	98250.606	4408.367
870622	1300	47935.531	98250.590	4408.354
870622	1335	47935.539	98250.631	4408.384
870622	1600	47935.527	98250.660	4408.422
870622	1640	47935.525	98250.615	4408.371
870627	1650	47935.508	98250.578	4408.371
870627	1750	47935.454	98250.603	4408.407
870627	1820	47935.502	98250.626	4408.385
870627	1842	47935.518	98250.596	4408.383
870627	1907	47935.478	98250.558	4408.365
870716	915	47935.403	98250.636	4408.286

DATA	TIME	NORTH	EAST	ELEV
870722	930	47935.360	98250.633	4408.273
870729	930	47935.294	98250.562	4408.286
870804	900	47935.158	98250.715	4408.201
870806	1245	47935.192	98250.746	4407.764
870806	1820	47935.080	98250.776	4408.078
870806	1845	47935.075	98250.812	4408.105
870806	1915	47935.084	98250.808	4408.075
870806	1940	47935.060	98250.773	4408.095
870806	2005	47935.086	98250.773	4408.057
870807	1400	47935.056	98250.787	4407.967
870807	1615	47935.049	98250.812	4407.984
870807	1655	47935.061	98250.807	4407.977
870807	1725	47935.053	98250.788	4407.977
870807	1755	47935.045	98250.780	4407.987
870817	1015	47934.760	98250.966	4407.796
870817	1418	47934.904	98250.832	4407.233
870817	1455	47934.871	98250.769	4407.243
870817	1520	47934.690	98250.886	4407.854
870823	1320	47934.632	98250.936	4407.569
870823	1440	47934.606	98250.981	4407.608
870823	1520	47934.621	98250.974	4407.583
870823	1550	47934.604	98250.937	4407.583
870823	1620	47934.585	98250.833	4407.535
870831	1130	47934.549	98250.940	4407.134
870831	1643	47934.464	98251.013	4407.420
870831	1710	47934.478	98251.018	4407.329
870831	1742	47934.451	98250.974	4407.350
870908	1145	47934.374	98251.088	4407.163
870908	1700	47934.335	98251.084	4407.265
870908	1744	47934.330	98251.097	4407.296
870908	1809	47934.343	98251.069	4407.225
870908	1836	47934.315	98251.082	4407.317
870909	1505	47934.380	98251.052	4407.102
870909	1805	47934.318	98251.125	4407.308
870909	1840	47934.323	98251.112	4407.303
870909	1940	47934.318	98251.103	4407.303
870915	1235	47934.214	98251.038	4407.190
870918	835	47934.205	98251.155	4407.171
870918	1510	47934.182	98251.121	4407.191
870918	1610	47934.197	98251.136	4407.171
870921	1010	47934.137	98251.119	4407.121
871001	1310	47934.040	98251.209	4407.057
871001	1605	47934.049	98251.227	4406.989
871001	1717	47934.030	98251.160	4406.969

SUMMARY OF DISPLACEMENT MONITORING DATA
MARCH-SEPTEMBER/1987

SUMMARY FOR PRISM 3

DATE	TIME	NORTH	EAST	ELEV
871002	1545	47934.235	98251.211	4406.979
871003	1715	47934.082	98251.206	4407.007
871005	1515	47934.042	98251.219	4406.999
871005	1525	47934.020	98251.218	4407.027
871004	1442	47933.994	98251.174	4406.980
871004	1620	47934.017	98251.208	4406.959
871004	1710	47934.006	98251.202	4406.980
871009	1210	47932.915	98251.154	4406.948
871009	1545	47932.953	98251.226	4406.983
871009	1640	47933.958	98251.269	4406.944
871014	1330	47933.916	98251.266	4406.884
871017	1432	47933.872	98251.287	4406.814
871017	1515	47933.879	98251.261	4406.831
871017	1615	47933.888	98251.257	4406.834
871020	1622	47933.845	98251.254	4406.788
871020	1810	47933.841	98251.244	4406.788
871023	1410	47933.841	98251.335	4406.775
871025	1245	47933.776	98251.248	4406.769
871026	1025	47933.825	98251.261	4406.718
871028	0925	47933.789	98251.280	4406.722
871102	1515	47933.775	98251.354	4406.662
871103	1615	47933.760	98251.384	4406.641
871103	1710	47933.786	98251.337	4406.611
871105	1145	47933.734	98251.318	4406.632
871105	1330	47933.722	98251.322	4406.639
871105	1415	47933.717	98251.335	4406.670
871113	1350	47933.688	98251.382	4406.586
871113	1435	47933.677	98251.365	4406.597
871118	1505	47933.659	98251.385	4406.543
871126	1412	47933.628	98251.422	4406.483
871126	1642	47933.625	98251.423	4406.494
871129	1315	47933.567	98251.349	4406.464
871129	1442	47933.581	98251.410	4406.471
871212	1245	47933.495	98251.413	4406.412
871220	1350	47933.438	98251.476	4406.475
871220	1445	47933.472	98251.482	4406.383
880113	1255	47933.248	98251.472	4406.233

SUMMARY OF DISPLACEMENT MONITORING DATA
OCTOBER TO DECEMBER/1987

SUMMARY FOR PRISM 4

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DATA	TIME	NORTH	EAST	ELEV
870302	1505	47739.652	98342.378	4251.369
870302	1552	47739.617	98342.415	4251.425
870302	1622	47739.559	98342.360	4251.636
870302	1655	47739.609	98342.449	4251.608
870302	1720	47739.624	98342.462	4251.580
870305	1100	47739.595	98342.496	4251.648
870306	1100	47739.501	98342.326	4251.625
870311	1330	47739.577	98342.443	4251.591
870319	1521	47739.299	98342.531	4251.438
870320	1420	47739.289	98342.505	4251.468
870320	1440	47739.296	98342.532	4251.487
870320	1515	47739.304	98342.518	4251.441
870320	1535	47739.287	98342.516	4251.456
870320	1555	47739.292	98342.514	4251.438
870323	1640	47739.277	98342.551	4251.430
870323	1705	47739.291	98342.575	4251.420
870323	1730	47739.291	98342.565	4251.442
870323	1800	47739.284	98342.538	4251.423
870323	1825	47739.290	98342.555	4251.432
870324	1400	47739.266	98342.556	4251.436
870324	1620	47739.293	98342.564	4251.432
870324	1645	47739.306	98342.578	4251.414
870324	1710	47739.301	98342.580	4251.432
870402	1225	47739.081	98342.560	4251.338
870408	1400	47739.184	98342.513	4250.833
870410	1648	47739.120	98342.613	4251.182
870410	1800	47739.080	98342.632	4251.339
870423	1113	47738.200	98342.624	4251.024
870429	1230	47738.983	98342.774	4251.126
870505	1240	47738.904	98342.632	4250.006
870505	1823	47738.877	98342.725	4250.956
870505	1848	47738.917	98342.758	4250.713
870505	1913	47738.840	98342.722	4251.106
870505	1938	47738.832	98342.706	4251.106
870513	1502	47738.852	98342.788	4250.982
870513	1807	47738.814	98342.775	4251.083
870513	1827	47738.803	98342.749	4251.044
870513	1849	47738.829	98342.798	4251.034
870513	1911	47738.800	98342.791	4251.078
870604	1350	47739.803	98342.501	4251.613
870604	1835	47739.765	98342.478	4251.665
870604	1920	47739.796	98342.534	4251.647
870612	930	47739.771	98342.496	4251.635
870612	1700	47739.752	98342.454	4251.635
870612	1745	47739.754	98342.453	4251.626
870622	1030	47739.733	98342.442	4251.641
870622	1145	47739.789	98342.528	4251.626
870622	1220	47739.772	98342.495	4251.595
870622	1300	47739.765	98342.488	4251.604
870622	1335	47739.750	98342.491	4251.632
870622	1600	47739.761	98342.520	4251.629
870622	1640	47739.746	98342.487	4251.629
870627	1650	47739.734	98342.472	4251.608
870627	1750	47739.706	98342.475	4251.700
870627	1820	47739.761	98342.550	4251.636
870627	1842	47739.730	98342.444	4251.581
870627	1907	47739.709	98342.443	4251.645
870716	915	47739.687	98342.472	4251.603
870722	930	47739.664	98342.493	4251.607
870729	930	47739.649	98342.429	4251.561
870804	900	47739.627	98342.520	4251.654
870806	1245	47739.740	98342.580	4251.268
870806	1820	47739.610	98342.529	4251.648
870806	1845	47739.633	98342.569	4251.670
870806	1915	47739.650	98342.592	4251.651
870806	1940	47739.632	98342.560	4251.660
870806	2005	47739.640	98342.566	4251.642
870807	1400	47739.619	98342.545	4251.569
870807	1615	47739.623	98342.553	4251.569
870807	1655	47739.635	98342.578	4251.569
870807	1725	47739.634	98342.548	4251.563
870807	1755	47739.648	98342.572	4251.554
870817	1015	47739.827	98343.156	4251.620
870817	1418	47739.741	98342.497	4250.970
870817	1455	47739.719	98342.487	4251.025
870817	1520	47739.569	98342.597	4251.659
870823	1320	47739.593	98342.616	4251.504
870823	1440	47739.564	98342.619	4251.526
870823	1520	47739.569	98342.617	4251.508
870823	1550	47739.565	98342.589	4251.480
870823	1620	47739.553	98342.534	4251.474
870831	1130	47739.594	98342.586	4251.240
870831	1643	47739.512	98342.633	4251.531
870831	1710	47739.536	98342.632	4251.418
870831	1742	47739.523	98342.598	4251.409
870908	1145	47739.538	98342.645	4251.275
870908	1700	47739.483	98342.667	4251.421
870908	1744	47739.485	98342.676	4251.459
870908	1809	47739.491	98342.673	4251.481
870908	1836	47739.491	98342.663	4251.422
870909	1505	47739.539	98342.621	4251.201
870909	1845	47739.473	98342.691	4251.484
870909	1840	47739.484	98342.697	4251.496
870909	1940	47739.467	98342.654	4251.487
870915	1235	47739.430	98342.641	4251.439
870918	835	47739.422	98342.695	4251.470
870918	1510	47739.430	98342.681	4251.424
870918	1610	47739.439	98342.697	4251.454
870921	1010	47739.395	98342.677	4251.455
871001	1310	47739.358	98342.704	4251.432
871001	1605	47739.363	98342.702	4251.414
871001	1717	47739.353	98342.686	4251.423

SUMMARY OF DISPLACEMENT MONITORING DATA

MARCH-SEPTEMBER/1987

SUMMARY FOR PRISM 4

DATE	TIME	NORTH	EAST	ELEV
871007	1545	47739.367	98342.710	4251.414
871008	1720	47739.354	98342.706	4251.411
871009	1615	47739.381	98342.724	4251.428
871023	1322	47739.355	98342.716	4251.460
871024	1442	47739.355	98342.695	4251.393
871004	1622	47739.367	98342.690	4251.347
871004	1710	47739.358	96342.714	4251.411
871008	1000	47739.327	98342.698	4251.415
871009	1210	47739.290	96342.655	4251.431
871009	1545	47739.335	98342.715	4251.375
871009	1640	47739.351	98342.768	4251.403
871014	1350	47739.311	98342.726	4251.397
871017	1420	47739.285	98342.707	4251.374
871017	1515	47739.303	98342.752	4251.383
871017	1615	47739.307	98342.758	4251.383
871020	1622	47739.277	98342.732	4251.368
871020	1812	47739.275	98342.722	4251.359
871023	1410	47739.276	98342.813	4251.378
871025	1245	47739.234	98342.711	4251.399
871026	1025	47739.248	98342.715	4251.362
871026	800	47739.245	98342.767	4251.375
871103	1515	47739.217	98342.779	4251.337
871103	1615	47739.216	98342.749	4251.338
871103	1710	47739.230	98342.814	4251.346
871105	1145	47739.210	98342.782	4251.325
871105	1330	47739.197	98342.778	4251.362
871105	1415	47739.199	98342.787	4251.331
871113	1350	47739.181	98342.816	4251.323
871113	1435	47739.157	98342.777	4251.341
871118	1505	47739.167	98342.833	4251.317
871126	1412	47739.146	98342.832	4251.312
871126	1640	47739.155	98342.838	4251.294
871129	1315	47739.095	98342.765	4251.337
871129	1442	47739.124	98342.812	4251.279
871212	1245	47739.087	98342.829	4251.277
871220	1352	47739.068	98342.858	4251.269
871220	1445	47739.092	98342.897	4251.250
880113	1255	47738.997	98342.881	4251.237

SUMMARY OF DISPLACEMENT MONITORING DATA
OCTOBER TO DECEMBER/1987

SUMMARY FOR PRISM 5

DATA	TIME	NORTH	EAST	ELEV
870302	1505	47516.130	98419.810	4137.573
870302	1552	47516.120	98419.877	4137.718
870302	1622	47516.094	98419.890	4137.631
870302	1655	47516.100	98417.887	4137.307
870302	1720	47516.105	98419.885	4137.783
870305	1100	47516.094	98417.881	4137.815
870306	1100	47516.002	98419.765	4137.823
870311	1330	47516.090	98419.856	4137.748
870319	1527	47515.585	98419.991	4137.658
870320	1420	47515.583	98419.992	4137.666
870320	1440	47515.601	98420.001	4137.617
870320	1515	47515.596	98420.003	4137.642
870320	1535	47515.590	98419.997	4137.650
870320	1555	47515.578	98419.994	4137.647
870323	1640	47515.580	98420.020	4137.645
870323	1705	47515.595	98420.030	4137.647
870323	1730	47515.594	98420.004	4137.650
870323	1800	47515.583	98420.000	4137.639
870323	1825	47515.580	98420.002	4137.655
870324	1400	47515.558	98419.968	4137.594
870324	1620	47515.594	98420.022	4137.639
870324	1645	47515.591	98420.006	4137.623
870324	1710	47515.592	98420.023	4137.647
870402	1225	47515.526	98419.957	4137.648
870408	1400	47515.648	98419.898	4137.125
870410	1640	47515.594	98419.986	4137.540
870410	1800	47515.567	98419.999	4137.695
870423	1113	47515.567	98419.945	4137.444
870429	1230	47515.567	98420.061	4137.637
870505	1240	47515.589	98419.908	4137.278
870505	1823	47515.553	98419.988	4137.487
870505	1848	47515.581	98420.010	4137.466
870505	1913	47515.517	98419.978	4137.634
870505	1938	47515.513	98419.980	4137.651
870513	1502	47515.530	98419.999	4137.506
870513	1807	47515.491	98420.018	4137.632
870513	1827	47515.506	98419.993	4137.579
870513	1849	47515.516	98420.024	4137.595
870513	1911	47515.512	98420.026	4137.611
870520	1320	47515.508	98420.000	4137.621
870520	1628	47515.512	98420.061	4137.710
870520	1645	47515.539	98420.057	4137.528
870520	1700	47515.539	98420.021	4137.549
870520	1715	47515.507	98419.974	4137.501
870526	1306	47515.538	98420.031	4137.488
870526	1642	47515.540	98420.030	4137.480
870526	1708	47515.533	98420.033	4137.512
870526	1730	47515.509	98420.018	4137.568
870526	1750	47515.508	98419.983	4137.555
870604	1350	47515.869	98420.104	4137.674
870604	1835	47515.843	98420.064	4137.718
870604	1920	47515.851	98420.134	4137.716
870612	930	47515.848	98420.088	4137.700
870612	1700	47515.838	98420.057	4137.684
870612	1745	47515.842	98420.064	4137.684
870622	1030	47515.835	98420.032	4137.694
870622	1145	47515.852	98420.077	4137.668
870622	1220	47515.857	98420.074	4137.686
870622	1300	47515.854	98420.067	4137.686
870622	1335	47515.853	98420.068	4137.652
870622	1600	47515.852	98420.086	4137.684
870622	1640	47515.838	98420.075	4137.673
870627	1650	47515.849	98420.051	4137.635
870627	1750	47515.814	98420.029	4137.756
870627	1820	47515.855	98420.102	4137.700

DATA	TIME	NORTH	EAST	ELEV
870627	1842	47515.863	98420.092	4137.668
870627	1907	47515.837	98420.049	4137.676
870716	915	47515.817	98420.048	4137.663
870722	930	47515.813	98420.067	4137.668
870729	930	47515.789	98419.998	4137.636
870804	900	47515.781	98420.074	4137.711
870806	1245	47515.883	98420.045	4137.309
870806	1820	47515.765	98420.056	4137.736
870806	1845	47515.782	98420.128	4137.757
870806	1915	47515.794	98420.105	4137.719
870806	1940	47515.790	98420.107	4137.736
870806	2005	47515.787	98420.090	4137.719
870807	1400	47515.761	98420.085	4137.680
870807	1615	47515.777	98420.077	4137.650
870807	1655	47515.782	98420.092	4137.658
870807	1725	47515.784	98420.065	4137.644
870807	1755	47515.774	98420.070	4137.650
870817	1015	47515.789	98420.150	4137.653
870817	1418	47515.929	98420.083	4137.892
870817	1455	47515.885	98420.024	4137.149
870817	1520	47515.735	98420.087	4137.734
870823	1320	47515.861	98420.080	4137.643
870823	1440	47515.769	98420.133	4137.651
870823	1520	47515.768	98420.116	4137.626
870823	1550	47515.745	98420.091	4137.624
870823	1620	47515.751	98420.061	4137.594
870831	1130	47515.773	98420.060	4137.316
870831	1643	47515.730	98420.125	4137.616
870831	1710	47515.768	98420.116	4137.549
870831	1742	47515.745	98420.082	4137.530
870908	1145	47515.765	98420.117	4137.482
870908	1700	47515.718	98420.122	4137.571
870908	1744	47515.734	98420.141	4137.590
870908	1809	47515.729	98420.116	4137.566
870908	1836	47515.727	98420.126	4137.590
870909	1505	47515.776	98420.112	4137.431
870909	1805	47515.725	98420.145	4137.587
870909	1840	47515.724	98420.145	4137.630
870909	1940	47515.713	98420.133	4137.646
870915	1235	47515.696	98420.105	4137.619
870915	1420	47515.702	98420.138	4137.617
870916	1035	47515.703	98420.120	4137.619
870917	1945	47515.693	98420.089	4137.603
870917	1515	47515.688	98420.109	4137.574
870918	835	47515.714	98420.159	4137.609
870918	1518	47515.699	98420.104	4137.569
870918	1610	47515.705	98420.137	4137.601
870919	900	47515.717	98420.166	4137.609
870920	1925	47515.706	98420.198	4137.647
870921	1010	47515.698	98420.126	4137.578
870922	930	47515.675	98420.160	4137.625
870923	815	47515.690	98420.126	4137.556
870924	845	47515.699	98420.148	4137.547
870924	1430	47515.667	98420.110	4137.612
870925	720	47515.688	98420.145	4137.596
870925	1430	47515.655	98420.107	4137.609
870926	850	47515.689	98420.171	4137.636
870926	1440	47515.646	98420.058	4137.596
870927	920	47515.675	98420.133	4137.620
870927	1350	47515.676	98420.142	4137.593
870927	820	47515.689	98420.162	4137.620
870930	925	47515.653	98420.126	4137.607
871001	1310	47515.660	98420.114	4137.601
871001	1605	47515.670	98420.110	4137.534
871001	1717	47515.663	98420.121	4137.601

SUMMARY OF DISPLACEMENT MONITORING DATA

MARCH-SEPTEMBER/1987

SUMMARY FOR PRISM 5

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DATE	TIME	NORTH	EAST	ELEV
871017	1420	47515.643	98420.122	4137.554
871017	1515	47515.629	98420.129	4137.575
871017	1615	47515.632	98420.136	4137.575
871020	1622	47515.620	98420.133	4137.573
871020	1810	47515.616	98420.135	4137.589
871023	1410	47515.632	98420.207	4137.576
871025	1245	47515.605	98420.113	4137.554
871026	1035	47515.607	98420.112	4137.546
871026	631	47515.615	98420.171	4137.576
871103	1515	47515.601	98420.186	4137.528
871103	1615	47515.583	98420.168	4137.560
871103	1710	47515.601	98420.195	4137.544
871105	1145	47515.580	98420.179	4137.550
871105	1330	47515.562	98420.169	4137.555
871105	1415	47515.570	98420.175	4137.539
871113	1350	47515.577	98420.207	4137.528
871118	1505	47515.559	98420.189	4137.518
871126	1412	47515.552	98420.219	4137.513
871126	1640	47515.554	98420.218	4137.548
871129	1316	47515.512	98420.167	4137.526
871129	1442	47515.528	98420.195	4137.518
871212	1245	47515.505	98420.214	4137.511
871220	1350	47515.507	98420.231	4137.492
871220	1445	47515.501	98420.234	4137.516
880113	1255	47515.445	98420.234	4137.512

SUMMARY OF DISPLACEMENT MONITORING DATA
OCTOBER TO DECEMBER/1987

SUMMARY FOR PRISM 6

DATA	TIME	NORTH	EAST	ELEV	DATA	TIME	NORTH	EAST	ELEV
870302	1505	47302.737	98507.077	4013.010	870627	1842	47302.274	98507.897	4012.939
870302	1552	47302.727	98507.120	4013.142	870627	1907	47302.255	98507.875	4012.944
870302	1622	47302.701	98507.133	4013.274	870716	915	47302.237	98507.874	4012.963
870302	1655	47302.702	98507.124	4013.253	870722	930	47302.232	98507.854	4012.949
870302	1720	47302.711	98507.128	4013.225	870729	930	47302.243	98507.857	4012.937
870305	1100	47302.701	98507.148	4013.259	870804	900	47302.242	98507.854	4013.009
870306	1100	47302.640	98507.039	4013.242	870806	1245	47302.255	98507.840	4012.637
870311	1330	47302.669	98507.102	4013.249	870806	1820	47302.207	98507.845	4012.988
870319	1527	47302.490	98507.159	4013.209	870806	1845	47302.231	98507.913	4013.023
870320	1420	47302.490	98507.151	4013.195	870806	1915	47302.232	98507.902	4013.002
870320	1440	47302.503	98507.160	4013.204	870806	1940	47302.231	98507.910	4013.023
870320	1515	47302.493	98507.165	4013.209	870806	2005	47302.230	98507.895	4012.995
870320	1535	47302.502	98507.161	4013.211	870807	1400	47302.215	98507.879	4012.929
870320	1555	47302.496	98507.164	4013.195	870807	1615	47302.207	98507.860	4012.922
870323	1640	47302.489	98507.175	4013.200	870807	1655	47302.229	98507.896	4012.952
870323	1705	47302.496	98507.186	4013.193	870807	1725	47302.231	98507.856	4012.912
870323	1730	47302.493	98507.157	4013.108	870807	1755	47302.230	98507.872	4012.947
870323	1800	47302.484	98507.162	4013.193	870817	1015	47302.236	98507.930	4012.993
870323	1825	47302.494	98507.157	4013.188	870817	1418	47302.315	98507.886	4012.361
870324	1400	47302.497	98507.140	4013.190	870817	1455	47302.315	98507.814	4012.425
870324	1620	47302.489	98507.167	4013.186	870817	1529	47302.199	98507.855	4012.919
870324	1645	47302.490	98507.167	4013.179	870823	1320	47302.217	98507.931	4012.931
870324	1719	47302.490	98507.174	4013.173	870823	1440	47302.239	98507.921	4012.915
870408	1400	47302.489	98507.553	4012.592	870823	1520	47302.221	98507.891	4012.929
870410	1648	47302.421	98507.640	4013.005	870823	1550	47302.217	98507.877	4012.915
870410	1800	47302.408	98507.670	4013.123	870823	1620	47302.206	98507.844	4012.894
870423	1113	47302.984	98508.136	4012.845	870831	1139	47302.237	98507.813	4012.606
870429	1230	47302.016	98508.216	4012.975	870831	1643	47302.202	98507.869	4012.869
870505	1240	47302.034	98508.084	4012.628	870831	1715	47302.213	98507.872	4012.827
870505	1823	47301.994	98508.142	4012.869	870831	1742	47302.218	98507.885	4012.834
870505	1848	47302.028	98508.172	4012.786	870908	1145	47302.232	98507.385	4012.678
870505	1913	47301.979	98508.126	4012.947	870908	1700	47302.189	98507.891	4012.821
870505	1938	47301.984	98508.154	4012.982	870908	1744	47302.195	98507.703	4012.872
870513	1502	47301.997	98508.125	4012.820	870908	1809	47302.188	98507.884	4012.814
870513	1807	47302.022	98508.198	4012.818	870908	1836	47302.186	98507.910	4012.656
870513	1827	47301.985	98508.200	4012.927	870909	1505	47302.228	98507.887	4012.749
870513	1849	47301.989	98508.221	4012.754	870909	1895	47302.180	98507.895	4012.870
870513	1911	47301.995	98508.211	4012.957	870909	1840	47302.186	98507.908	4012.870
870520	1320	47301.981	98508.194	4012.934	870909	1940	47302.195	98507.950	4012.918
870520	1628	47301.966	98508.271	4013.011	870915	1235	47302.179	98507.857	4012.844
870520	1645	47301.994	98508.265	4012.879	870915	1429	47302.150	98507.849	4012.854
870520	1700	47301.978	98508.227	4012.872	870916	1035	47302.174	98507.875	4012.856
870520	1715	47301.920	98508.139	4012.884	870917	1345	47302.189	98507.891	4012.872
870526	1306	47301.989	98508.268	4012.812	870918	835	47302.177	98507.935	4012.916
870526	1642	47301.981	98508.241	4012.792	870918	1519	47302.147	98507.865	4012.852
870526	1708	47301.967	98508.247	4012.861	870918	1610	47302.167	98507.886	4012.861
870526	1739	47301.951	98508.217	4012.868	870919	930	47302.174	98507.916	4012.858
870526	1750	47301.931	98508.173	4012.861	870920	1025	47302.173	98507.929	4012.872
870604	1350	47302.293	98507.703	4012.985	870921	1319	47302.158	98507.891	4012.859
870604	1835	47302.268	98507.900	4012.988	870922	930	47302.138	98507.870	4012.850
870604	1920	47302.288	98507.937	4012.981	870923	815	47302.159	98507.879	4012.866
870612	930	47302.273	98507.897	4012.964	870924	845	47302.155	98507.892	4012.872
870612	1719	47302.270	98507.891	4012.980	870924	1439	47302.110	98507.872	4012.845
870612	1745	47302.268	98507.892	4012.974	870925	920	47302.167	98507.917	4012.872
870622	1030	47302.283	98507.877	4012.927	870925	1439	47302.132	98507.873	4012.884
870622	1145	47302.297	98507.909	4012.934	870926	850	47302.143	98507.906	4012.905
870622	1220	47302.283	98507.909	4012.925	870926	1440	47302.112	98507.813	4012.843
870622	1300	47302.267	98507.877	4012.946	870927	920	47302.150	98507.871	4012.852
870622	1335	47302.277	98507.895	4012.939	870928	1350	47302.089	98507.913	4012.849
870622	1600	47302.274	98507.920	4012.958	870929	820	47302.085	98507.911	4012.821
870622	1640	47302.263	98507.902	4012.965	870930	925	47302.069	98507.880	4012.828
870627	1650	47302.265	98507.855	4012.911	871001	1310	47302.047	98507.845	4012.849
870627	1759	47302.212	98507.835	4013.041	871001	1635	47302.061	98507.853	4012.807
870627	1820	47302.287	98507.937	4012.937	871001	1717	47302.064	98507.867	4012.821

SUMMARY OF DISPLACEMENT MONITORING DATA

MARCH-SEPTEMBER/1987

SUMMARY FOR PRISM 6

DATE	TIME	NORTH	EAST	ELEV
871002	1545	47302.065	98507.890	4012.819
871002	1720	47302.061	98507.884	4012.819
871002	1815	47302.073	98507.878	4012.807
871003	1300	47302.088	98507.879	4012.890
871004	1442	47302.051	98507.873	4012.840
871004	1620	47302.048	98507.860	4012.826
871004	1710	47302.065	98507.890	4012.863
871006	1100	47302.032	98507.891	4012.813
871008	1000	47302.068	98507.896	4012.819
871009	1210	47302.077	98507.938	4012.817
871009	1545	47302.049	98507.867	4012.789
871009	1640	47302.063	98507.906	4012.810
871014	1350	47302.069	98507.942	4012.858
871017	1420	47302.031	98507.837	4012.803
871017	1515	47302.056	98507.863	4012.798
871017	1615	47302.044	98507.861	4012.796
871020	1622	47302.033	98507.859	4012.794
871020	1810	47302.030	98507.868	4012.822
871023	1410	47302.056	98507.910	4012.845
871025	1245	47302.011	98507.855	4012.827
871026	1025	47302.023	98507.864	4012.799
871028	831	47302.032	98507.906	4012.847
871103	1515	47302.013	98507.861	4012.783
871103	1615	47302.010	98507.855	4012.783
871103	1710	47302.044	98507.931	4012.847
871105	1145	47302.017	98507.898	4012.845
871105	1330	47302.014	98507.869	4012.797
871105	1415	47302.006	98507.872	4012.788
871113	1350	47302.030	98507.915	4012.824
871118	1505	47302.009	98507.879	4012.788
871126	1412	47302.003	98507.897	4012.806
871126	1640	47302.029	98507.931	4012.765
871129	1316	47301.979	98507.839	4012.786
871129	1442	47301.968	98507.837	4012.827
871212	1245	47301.992	98507.887	4012.784
871220	1350	47301.982	98507.892	4012.788
871220	1445	47301.988	98507.905	4012.788
880113	1255	47301.953	98507.852	4012.779

SUMMARY OF DISPLACEMENT MONITORING DATA
OCTOBER TO DECEMBER/1987

SUMMARY FOR PRISM 7

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DATA	TIME	NORTH	EAST	ELEV
870324	1400	47291.214	97982.286	4179.328
870324	1620	47291.227	97982.297	4179.320
870324	1645	47291.218	97982.294	4179.337
870324	1710	47291.236	97982.311	4179.328
870402	1225	47291.176	97982.265	4179.342
870408	1400	47291.278	97982.161	4178.809
870410	1648	47291.205	97982.227	4179.248
870410	1800	47291.213	97982.287	4179.372
870423	1113	47291.182	97982.158	4179.183
870429	1230	47291.241	97982.318	4179.372
870505	1240	47291.264	97982.117	4178.743
870505	1823	47291.201	97982.242	4179.217
870505	1848	47291.195	97982.225	4179.193
870505	1913	47291.168	97982.238	4179.337
870505	1939	47291.171	97982.235	4179.320
870513	1532	47291.217	97982.216	4179.189
870513	1807	47291.164	97982.231	4179.328
870513	1827	47291.160	97982.223	4179.320
870513	1849	47291.194	97982.271	4179.345
870513	1911	47291.180	97982.272	4179.386
870520	1320	47291.175	97982.232	4179.339
870520	1628	47291.192	97982.295	4179.447
870520	1645	47291.211	97982.244	4179.273
870520	1700	47291.198	97982.233	4179.281
870520	1715	47291.151	97982.175	4179.264
870526	1306	47291.246	97982.246	4179.181
870526	1642	47291.220	97982.259	4179.245
870526	1708	47291.183	97982.235	4179.287
870526	1730	47291.191	97982.240	4179.278
870526	1750	47291.148	97982.189	4179.220
870604	1350	47291.236	97982.300	4179.303
870604	1335	47291.199	97982.274	4179.326
870604	1920	47291.222	97982.313	4179.334
870612	930	47291.185	97982.268	4179.361
870612	1700	47291.160	97982.223	4179.320
870612	1745	47291.168	97982.238	4179.337
870622	1030	47291.174	97982.210	4179.289
870622	1145	47291.226	97982.275	4179.306
870622	1220	47291.225	97982.288	4179.303
870622	1300	47291.189	97982.241	4179.323
870622	1335	47291.212	97982.243	4179.264
870622	1600	47291.212	97982.277	4179.312
870622	1640	47291.195	97982.248	4179.287
870627	1650	47291.171	97982.235	4179.320
870627	1750	47291.119	97982.170	4179.303
870627	1820	47291.211	97982.323	4179.428
870627	1842	47291.182	97982.248	4179.320
870627	1907	47291.159	97982.212	4179.295
870716	915	47291.152	97982.217	4179.328
870722	930	47291.139	97982.217	4179.336
870729	930	47291.155	97982.226	4179.301
870804	903	47291.125	97982.219	4179.367
870806	1245	47291.284	97982.166	4178.809
870806	1820	47291.136	97982.222	4179.336
870806	1845	47291.155	97982.272	4179.417
870806	1915	47291.171	97982.281	4179.356
870806	1940	47291.154	97982.262	4179.392
870806	2005	47291.165	97982.263	4179.367
870807	1400	47291.148	97982.267	4179.309
870807	1615	47291.159	97982.255	4179.312
870807	1655	47291.169	97982.282	4179.329
870807	1725	47291.194	97982.293	4179.323
870807	1755	47291.198	97982.301	4179.331
870817	1015	47291.197	97982.322	4179.425
870817	1418	47291.293	97982.123	4178.648
870817	1455	47291.296	97982.132	4178.693
870817	1520	47291.125	97982.216	4179.367
870823	1320	47291.195	97982.257	4179.347
870823	1440	47291.262	97982.284	4179.317
870823	1520	47291.177	97982.278	4179.317
870823	1550	47291.158	97982.256	4179.331
870823	1620	47291.159	97982.219	4179.301
870831	1130	47291.231	97982.145	4178.901
870831	1643	47291.162	97982.230	4179.256
870831	1710	47291.147	97982.210	4179.248
870831	1742	47291.161	97982.209	4179.206
870908	1145	47291.194	97982.201	4179.214
870908	1738	47291.166	97982.249	4179.254
870908	1744	47291.167	97982.270	4179.304
870908	1809	47291.142	97982.226	4179.262
870908	1836	47291.140	97982.227	4179.270
870907	1505	47291.239	97982.221	4179.106
870909	1805	47291.139	97982.251	4179.293
870909	1840	47291.129	97982.260	4179.307
870909	1940	47291.123	97982.254	4179.307
870915	1235	47291.101	97982.196	4179.223
870915	1420	47291.089	97982.229	4179.260
870916	1035	47291.193	97982.227	4179.218
870917	1045	47291.084	97982.222	4179.260
870917	1515	47291.056	97982.203	4179.249
870918	835	47291.056	97962.203	4179.249
870918	1510	47291.081	97982.237	4179.265
870918	1610	47291.105	97982.249	4179.268
870919	900	47291.086	97982.243	4179.265
870920	1025	47291.103	97982.261	4179.265
870921	1310	47291.067	97982.215	4179.249
870922	930	47291.051	97982.241	4179.241
870923	815	47291.064	97982.218	4179.265
870924	845	47291.101	97982.252	4179.249
870924	1430	47291.058	97982.212	4179.229
870925	920	47291.069	97982.237	4179.263
870925	1430	47291.054	97982.215	4179.246
870926	850	47291.064	97982.229	4179.254
870926	1440	47291.056	97982.203	4179.249
870927	920	47291.086	97982.243	4179.265
870928	1350	47291.085	97982.255	4179.263
870929	820	47291.097	97982.255	4179.265
870930	925	47291.086	97982.254	4179.254
871001	1310	47291.035	97982.244	4179.219
871001	1605	47291.013	97982.163	4179.265
871001	1717	47291.043	97982.203	4179.246

SUMMARY OF DISPLACEMENT MONITORING DATA

MARCH-SEPTEMBER/1987

SUMMARY FOR PRISM 7

DATE	TIME	NORTH	EAST	ELEV
871002	1545	47291.075	97982.231	4179.229
871002	1720	47291.066	97982.228	4179.246
871002	1815	47291.088	97982.252	4179.246
871003	1300	47291.050	97982.275	4179.252
871004	1442	47291.062	97982.242	4179.252
871004	1620	47291.047	97982.211	4179.25-
871004	1710	47291.036	97982.198	4179.254
871006	1100	47291.051	97982.230	4179.216
871008	1002	47291.053	97982.239	4179.232
871009	1210	47291.046	97982.257	4179.219
871009	1545	47291.039	97982.241	4179.238
871009	1640	47291.050	97982.253	4179.238
871014	1350	47291.044	97982.247	4179.202
871017	1420	47291.016	97982.217	4179.166
871017	1515	47291.010	97982.221	4179.191
871017	1615	47291.009	97982.212	4179.210
871020	1622	47290.961	97982.188	4179.205
871020	1810	47290.955	97982.182	4179.205
871023	1410	47291.012	97982.288	4179.161
871025	1245	47290.949	97982.233	4179.159
871026	1025	47290.955	97982.226	4179.125
871027	1145	47290.939	97982.219	4179.150
871028	831	47290.944	97982.259	4179.162
871029	916	47290.959	97982.302	4179.148
871030	945	47290.891	97982.251	4179.134
871031	935	47290.948	97982.301	4179.101
871101	840	47290.905	97982.317	4179.107
871102	1210	47290.824	97982.301	4179.246
871103	1515	47290.834	97982.269	4179.030
871103	1615	47290.838	97982.277	4179.038
871104	1030	47290.826	97982 310	4179.039
871104	1410	47290.860	97982.335	4179.005
871105	1145	47290.781	97982.283	4179.017
871105	1330	47290.807	97982.305	4178.964
871105	1415	47290.767	97982.285	4179.022
871106	1330	47290.787	97982.300	4179.006
871107	1010	47290.818	97982.317	4179.000
871108	1125	47290.806	97982.317	4179.033
871109	1130	47290.793	97982.340	4179.009
871110	1455	47290.788	97982.356	4178.987
871112	1125	47290.781	97982.348	4179.006
871113	1350	47290.782	97982.339	4178.962
871113	1435	47290.745	97982.316	4179.003
871114	935	47290.784	97982.348	4178.978
871116	1145	47290.779	97982.342	4179.014
871117	1340	47290.801	97982.367	4178.942
871118	1505	47290.784	97982.359	4178.967
871119	1010	47290.752	97982.309	4178.970
871120	1255	47290.760	97982.336	4178.940
871121	940	47290.717	97982.296	4178.956
871123	1320	47290.776	97982.344	4178.951
871124	1520	47290.754	97982.338	4178.940
871125	1250	47290.759	97982.326	4178.915
871126	1412	47290.780	97982.352	4178.923
871126	1640	47290.728	97982.309	4178.956
871127	1109	47290.704	97982.320	4178.976
871127	1530	47290.733	97982.338	4178.943
871128	1309	47290.727	97982.310	4178.965
871129	1316	47290.711	97982.290	4178.921
871129	1442	47290.737	97982.357	4178.940
871130	1230	47290.659	97982.293	4178.954
871201	1345	47290.723	97982.325	4178.899
871204	1150	47290.711	97982.347	4178.918
871204	1520	47290.729	97982.353	4178.913
871205	1430	47290.720	97982.350	4178.929
871206	1320	47290.695	97982.350	4178.924
871207	1025	47290.679	97982.320	4178.891
871208	1200	47290.669	97982.340	4178.930
871210	1110	47290.782	97982.355	4178.916
871211	1000	47290.686	97982.359	4178.930
871212	1245	47290.677	97982.332	4178.888
871213	1145	47290.673	97982.347	4178.974
871214	1525	47290.663	97982.323	4178.985
871215	1150	47290.685	97982.348	4178.985
871216	1130	47290.680	97982.342	4178.985
871217	1310	47290.693	97982.363	4178.885
871219	1330	47290.682	97982.373	4178.899
871220	1350	47290.676	97982.356	4178.910
871220	1445	47290.688	97982.368	4178.910
871221	1510	47290.653	97982.354	4178.933
871223	1045	47290.687	97982.357	4178.885
871228	1130	47290.654	97982.353	4178.888
871230	1150	47290.666	97982.376	4178.949

SUMMARY OF DISPLACEMENT MONITORING DATA
OCTOBER TO DECEMBER/1987

SUMMARY FOR PRISM 8

DATA	TIME	NORTH	EAST	ELEV	DATA	TIME	NORTH	EAST	ELEV
870302	1505	47839.835	99293.287	4010.435	870622	1030	47839.631	99293.289	4010.693
870302	1552	47838.816	99293.296	4010.541	870622	1145	47833.621	99293.357	4010.712
870306	1100	47839.776	99293.159	4010.733	870622	1220	47839.642	99293.415	4010.669
870311	1339	47838.788	99293.267	4010.727	870622	1330	47839.633	99293.367	4010.685
870319	1527	47838.761	99293.309	4010.742	870622	1335	47839.624	99293.377	4010.675
870321	1440	47838.761	99293.336	4010.733	870622	1600	47838.625	99293.386	4010.666
870320	1535	47839.761	99293.369	4010.742	870622	1640	47838.613	99293.341	4010.700
870320	1555	47838.762	99293.300	4010.742	870627	1750	47838.573	99293.311	4010.956
870323	1705	47838.734	99293.369	4010.756	870627	1820	47839.663	99293.390	4010.435
870323	1730	47838.752	99293.335	4010.722	870627	1842	47838.637	99293.370	4010.624
870323	1800	47839.749	99293.326	4010.749	870627	1907	47839.619	99293.341	4010.664
870323	1825	47838.748	99293.335	4010.749	870722	933	47838.579	99293.318	4010.665
870324	1400	47839.752	99293.300	4010.740	870729	930	47839.572	99293.362	4010.693
870324	1620	47838.747	99293.362	4010.731	870804	930	47839.554	99293.352	4010.744
870324	1645	47839.744	99293.379	4010.749	870806	1245	47839.622	99293.351	4010.337
870324	1710	47839.746	99293.379	4010.740	870806	1820	47838.547	99293.389	4010.771
870402	1225	47839.752	99293.175	4010.684	870806	1845	47839.551	99293.433	4010.718
870408	1400	47839.812	99293.243	4010.349	870806	1915	47839.547	99293.424	4010.736
870410	1648	47839.757	99293.291	4010.659	870806	1940	47839.546	99293.397	4010.771
870410	1800	47838.729	99293.387	4010.774	870806	2005	47838.548	99293.398	4010.753
870423	1113	47839.710	99293.251	4010.778	870807	1400	47839.539	99293.308	4010.670
870429	1230	47838.666	99293.481	4010.928	870807	1655	47838.542	99293.361	4010.688
870505	1240	47839.692	99293.303	4010.794	870807	1725	47838.545	99293.344	4010.679
870505	1823	47838.728	99293.271	4010.599	870807	1755	47838.556	99293.345	4010.672
870505	1848	47839.701	99293.304	4010.677	870823	1320	47838.509	99293.419	4010.674
870505	1913	47838.703	99293.278	4010.741	870823	1440	47838.515	99293.349	4010.674
870505	1939	47839.700	99293.295	4010.750	870823	1520	47839.515	99293.366	4010.665
870513	1502	47838.753	99293.291	4010.558	870831	1139	47838.535	99293.339	4010.426
870513	1807	47838.696	99293.321	4010.704	870831	1643	47839.562	99293.365	4010.563
870513	1827	47838.709	99293.296	4010.697	870831	1710	47838.484	99293.355	4010.551
870513	1849	47839.719	99293.323	4010.624	870831	1742	47838.490	99293.347	4010.579
870513	1911	47838.702	99293.349	4010.714	870908	1145	47838.477	99293.346	4010.434
870520	1320	47839.684	99293.303	4010.783	870908	1700	47839.431	99293.430	4010.589
870520	1628	47838.692	99293.374	4010.695	870908	1744	47838.427	99293.422	4010.617
870520	1645	47839.698	99293.394	4010.659	870908	1809	47839.439	99293.378	4010.571
870520	1700	47838.694	99293.321	4010.713	870908	1836	47838.441	99293.413	4010.599
870520	1715	47839.683	99293.276	4010.801	870909	1505	47838.480	99293.408	4010.424
870526	1306	47839.795	99293.358	4010.569	870909	1805	47838.430	99293.412	4010.661
870526	1642	47839.768	99293.331	4010.566	870909	1840	47838.420	99293.420	4010.660
870526	1708	47838.694	99293.339	4010.649	870909	1940	47838.430	99293.439	4010.652
870526	1730	47838.694	99293.330	4010.649	870918	835	47839.396	99293.436	4010.674
870526	1750	47839.651	99293.229	4010.959	870918	1515	47838.427	99293.357	4010.647
870604	1350	47839.159	99293.310	4010.578	870918	1610	47839.395	99293.392	4010.637
870624	1835	47838.631	99293.369	4010.703	870921	1310	47838.372	99293.398	4010.651
870604	1920	47838.625	99293.395	4010.720	871001	1310	47839.429	99293.332	4010.651
870612	930	47838.627	99293.351	4010.675	871001	1605	47839.321	99293.403	4010.652
870612	1700	47839.632	99293.351	4010.703	871001	1717	47839.324	99293.385	4010.643
870612	1745	47838.628	99293.396	4010.733					

SUMMARY OF DISPLACEMENT MONITORING DATA

MARCH-SEPTEMBER/1987

SUMMARY FOR PRISM 8

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DATE	TIME	NORTH	EAST	ELEV
871002	1545	47838.317	99293.447	4010.652
871002	1720	47838.329	99293.421	4010.654
871002	1815	47838.318	99293.456	4010.643
871004	1442	47838.324	99293.368	4010.652
871004	1620	47838.322	99293.483	4010.643
871004	1710	47838.321	99293.483	4010.652
871009	1210	47838.318	99293.447	4010.643
871009	1640	47838.288	99293.453	4010.638
871014	1350	47838.284	99293.462	4010.656
871017	1420	47838.272	99293.398	4010.644
871017	1515	47838.293	99293.436	4010.620
871017	1615	47838.284	99293.391	4010.637
871105	1145	47838.222	99293.483	4010.636
871105	1330	47838.216	99293.429	4010.653
871105	1415	47838.215	99293.385	4010.625
871113	1350	47838.228	99293.466	4010.628
871113	1435	47838.192	99293.481	4010.650
871118	1505	47838.199	99293.455	4010.623
871126	1412	47838.188	99293.445	4010.631
871128	1309	47838.188	99293.445	4010.631
880113	1255	47838.160	99293.327	4010.615

SUMMARY OF DISPLACEMENT MONITORING DATA
OCTOBER TO DECEMBER/1987

SUMMARY FOR PRISM 9

DATA	TIME	NORTH	EAST	ELEV
870306	1100	49075.903	99324.780	4165.130
870311	1330	48075.897	99324.820	4166.110
870319	1527	48075.871	99324.839	4166.126
870320	1440	48075.862	99324.867	4166.156
870320	1535	49075.864	99324.867	4165.146
870320	1555	48075.859	99324.867	4166.166
870323	1705	48075.843	99324.926	4166.121
870323	1730	48075.856	99324.897	4166.123
870323	1800	49075.847	99324.886	4165.121
870323	1825	48075.856	99324.897	4166.123
870324	1400	49075.879	99324.879	4166.118
870324	1620	48075.855	99324.927	4166.113
870324	1645	49075.850	99324.936	4166.133
870324	1710	48075.853	99324.927	4166.123
870402	1225	49075.868	99324.687	4165.817
870408	1400	48075.927	99324.762	4165.674
870410	1648	49075.869	99324.858	4165.989
870412	1800	48075.028	99324.944	4166.181
870423	1113	49075.817	99324.772	4165.670
870429	1230	48075.737	99325.057	4166.269
870505	1240	48075.783	99324.809	4166.116
870505	1823	48075.834	99324.854	4165.823
870505	1848	48075.792	99324.830	4166.824
870505	1913	48075.784	99324.870	4166.086
870505	1939	49075.779	99324.900	4165.896
870513	1502	48075.814	99324.822	4165.881
870513	1807	49075.779	99324.890	4166.854
870513	1827	48075.781	99324.870	4166.054
870513	1849	49075.804	99324.892	4165.944
870513	1911	48075.789	99324.890	4166.056
870520	1320	49075.776	99324.929	4165.854
870520	1628	48075.766	99324.949	4166.042
870520	1645	48075.776	99324.919	4166.812
870520	1700	48075.758	99324.868	4166.112
870520	1715	49075.745	99324.816	4166.192
870526	1336	48075.780	99324.930	4165.937
870526	1642	49075.800	99324.881	4165.827
870526	1708	48075.769	99324.858	4165.977
870526	1730	48075.772	99324.919	4165.937
870526	1750	48075.698	99324.751	4166.338
870604	1350	48075.728	99324.915	4166.843
870604	1035	48075.710	99324.933	4166.081
870604	1920	49075.698	99324.983	4166.859
870612	930	48075.655	99324.892	4166.914
870612	1700	49075.708	99324.893	4166.806
870612	1745	48075.686	99324.931	4166.987
870622	1030	48075.703	99324.832	4166.884
870622	1145	48075.692	99325.022	4165.774
870622	1220	49075.719	99324.954	4165.884
870622	1330	48075.738	99324.923	4165.944
870622	1335	49075.692	99324.961	4165.882

DATA	TIME	NORTH	EAST	ELEV
870622	1600	48075.682	99324.931	4166.012
870622	1640	48075.694	99324.871	4165.822
870627	1650	48075.684	99324.891	4165.928
870627	1750	49075.626	99324.825	4166.266
870627	1820	48075.739	99325.007	4165.679
870627	1842	49075.698	99324.942	4165.890
870627	1907	48075.686	99324.831	4165.990
870716	915	49075.619	99324.923	4165.977
870722	930	48075.613	99324.883	4165.975
870729	930	49075.592	99324.941	4165.956
870804	900	48075.559	99324.898	4166.026
870806	1245	48075.623	99324.915	4165.684
870806	1820	48075.545	99324.959	4166.014
870806	1845	49075.545	99324.989	4166.004
870806	1915	48075.548	99324.999	4165.984
870806	1940	49075.515	99324.976	4166.144
870806	2005	48075.545	99324.959	4166.014
870807	1400	48075.545	99324.858	4165.917
870807	1615	48075.530	99324.927	4165.957
870807	1655	48075.535	99324.927	4165.937
870807	1725	48075.556	99324.939	4165.742
870807	1755	49075.547	99324.919	4165.936
870817	1015	48075.544	99324.997	4165.773
870817	1418	49075.690	99324.828	4165.232
870817	1455	48075.673	99324.849	4165.172
870817	1520	49075.510	99324.943	4165.995
870823	1329	48075.495	99324.992	4165.656
870823	1440	49075.505	99324.893	4165.899
870823	1520	48075.479	99324.922	4165.866
870823	1550	49075.470	99324.900	4165.870
870823	1620	48075.514	99324.873	4165.869
870831	1130	49075.482	99324.861	4165.599
870831	1643	48075.473	99324.949	4165.745
870831	1710	49075.465	99324.919	4165.743
870831	1742	48075.478	99324.919	4165.735
870908	1145	48075.452	99324.928	4165.614
870908	1700	48075.439	99324.974	4165.742
870908	1744	48075.413	99324.985	4165.765
870908	1809	48075.422	99324.945	4165.745
870908	1836	49075.414	99324.955	4165.775
870909	1535	48075.473	99324.969	4165.567
870909	1805	48075.393	99324.983	4165.855
870909	1840	48075.394	99325.033	4165.845
870909	1940	48075.398	99324.963	4165.845
870910	835	48075.348	99324.989	4165.824
870910	1510	48075.356	99324.909	4165.824
870910	1610	48075.354	99324.949	4165.814
870921	1610	48075.329	99324.927	4165.797
871001	1319	48075.317	99324.886	4165.731
871001	1605	48075.264	99324.931	4165.804
871001	1717	48075.273	99324.952	4165.774

SUMMARY OF DISPLACEMENT MONITORING DATA

MARCH-SEPTEMBER/1987

SUMMARY FOR PRISM 9

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DATE	TIME	NORTH	EAST	ELEV
871002	1545	48075.261	99325.011	4165.837
871002	1720	48075.270	99324.982	4165.764
871002	1815	48075.270	99325.002	4165.754
871003	1300	48075.287	99324.822	4165.754
871004	1442	48075.259	99324.910	4165.758
871004	1620	48075.251	99324.920	4165.875
871004	1710	48075.266	99324.951	4165.794
871009	1210	48075.233	99324.978	4165.746
871009	1640	48075.231	99325.059	4165.768
871014	1350	48075.213	99324.987	4165.741
871105	1145	48075.117	99324.948	4165.678
871105	1330	48075.115	99324.978	4165.678
871105	1415	48075.118	99324.938	4165.677
871113	1350	48075.096	99325.016	4165.653
871118	1505	48075.071	99325.004	4165.679
871126	1412	48075.059	99324.962	4165.654

SUMMARY OF DISPLACEMENT MONITORING DATA
OCTOBER TO DECEMBER/1987

SUMMARY FOR PRISM 10
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DATA	TIME	NORTH	EAST	ELEV	DATA	TIME	NORTH	EAST	ELEV
870306	1100	48357.811	99297.347	4369.215	870622	1600	48356.564	99297.760	4368.888
870311	1330	48356.975	99297.584	4369.246	870622	1640	48355.553	99297.692	4369.911
870319	1527	48356.934	99297.581	4369.247	870627	1650	48356.596	99297.717	4368.706
870320	1440	48356.914	99297.636	4369.304	870627	1750	48355.464	99297.592	4369.213
870320	1535	48356.920	99297.591	4369.292	870627	1820	48356.672	99297.836	4368.417
870320	1555	48356.925	99297.614	4369.269	870627	1842	48355.584	99297.761	4368.747
870323	1705	48356.903	99297.659	4369.227	870627	1937	48356.553	99297.691	4369.072
870323	1730	48356.911	99297.626	4369.241	870716	915	48355.476	99297.741	4368.765
870323	1800	48355.911	99297.636	4369.241	870720	930	48356.422	99297.680	4368.749
870323	1825	48356.909	99297.613	4369.253	870729	930	48356.392	99297.689	4369.741
870324	1400	48355.910	99297.590	4369.253	870804	930	48356.294	99297.762	4368.886
870324	1620	48356.914	99297.682	4369.219	870806	1245	48355.414	99297.750	4368.429
870324	1645	48355.908	99297.670	4369.241	870806	1820	48356.338	99297.833	4368.744
870324	1710	48356.911	99297.682	4369.230	870806	1845	48355.310	99297.856	4369.733
870402	1225	48355.919	99297.375	4369.128	870806	1915	48356.338	99297.845	4368.714
870408	1400	48357.922	99297.473	4368.795	870806	1940	48355.310	99297.856	4369.733
870410	1648	48355.919	99297.614	4369.234	870806	2005	48356.320	99297.846	4368.699
870412	1800	48356.864	99297.791	4369.242	870807	1400	48355.308	99297.697	4369.698
870423	1113	48355.839	99297.528	4369.120	870807	1615	48356.335	99297.788	4368.657
870429	1230	48356.725	99297.851	4369.328	870807	1655	48355.342	99297.799	4369.671
870505	1240	48356.818	99297.493	4369.116	870807	1725	48356.322	99297.732	4368.648
870505	1823	48356.856	99297.587	4368.820	870807	1755	48355.330	99297.755	4369.614
870505	1848	48356.800	99297.606	4369.813	870817	1015	48356.273	99297.875	4368.490
870505	1913	48356.787	99297.616	4369.075	870817	1418	48355.286	99297.648	4369.501
870505	1939	48355.784	99297.604	4369.870	870817	1455	48356.333	99297.626	4368.414
870513	1502	48356.835	99297.562	4368.826	870817	1520	48355.254	99297.782	4369.591
870513	1807	48356.759	99297.648	4369.839	870823	1329	48356.189	99297.926	4368.553
870513	1827	48356.764	99297.614	4369.928	870823	1440	48355.200	99297.767	4369.553
870513	1849	48356.787	99297.662	4369.937	870823	1523	48356.230	99297.778	4368.553
870513	1911	48356.773	99297.626	4369.895	870823	1550	48355.175	99297.720	4369.592
870520	1320	48355.728	99297.669	4369.105	870823	1620	48356.196	99297.733	4368.576
870520	1628	48356.722	99297.760	4369.308	870831	1130	48355.178	99297.674	4369.214
870520	1645	48355.768	99297.695	4368.920	870831	1643	48356.138	99297.786	4368.475
870520	1700	48356.733	99297.647	4369.056	870831	1710	48355.149	99297.768	4369.351
870520	1715	49356.710	99297.565	4369.159	870831	1742	48356.169	99297.753	4368.372
870526	1336	48356.749	99297.727	4368.931	870908	1145	48355.100	99297.783	4369.280
870526	1642	49355.705	99297.730	4368.705	870908	1750	48356.069	99297.863	4368.334
870526	1708	48356.729	99297.658	4368.921	870908	1744	48355.053	99297.848	4369.391
870526	1730	48356.742	99297.659	4369.839	870908	1809	48356.074	99297.827	4368.359
870526	1750	48356.622	99297.525	4369.330	870908	1836	48355.061	99297.837	4369.368
870604	1350	49355.659	99297.733	4369.964	870909	1595	48356.145	99297.829	4368.146
870604	1835	48356.621	99297.604	4369.075	870909	1805	48355.042	99297.870	4369.425
870604	1920	49356.627	99297.742	4369.041	870909	1843	48356.038	99297.881	4368.436
870612	730	48356.611	99297.695	4368.962	870909	1940	48355.033	99297.859	4369.459
870612	1700	48355.599	99297.717	4369.996	870918	935	48355.964	99297.687	4368.193
870612	1745	48356.578	99297.750	4369.064	870918	1510	48355.970	99297.797	4369.403
870622	1030	48356.643	99297.615	4369.860	870918	1610	48355.974	99297.831	4368.380
870622	1145	48356.587	99297.807	4368.371	870921	1610	48355.921	99297.856	4369.378
870622	1220	48355.593	99297.808	4369.895	870921	1313	48355.863	99297.812	4368.263
870622	1300	48356.597	99297.795	4368.869	871001	1605	48355.837	99297.901	4369.331
870622	1335	48356.599	99297.717	4369.848	871001	1717	48355.849	99297.868	4368.324

SUMMARY OF DISPLACEMENT MONITORING DATA

MARCH-SEPTEMBER/1987

SUMMARY FOR PRISM 10

DATE	TIME	NORTH	EAST	ELEV
871002	1545	48355.836	99297.924	4368.294
871002	1720	48355.844	99297.902	4368.308
871002	1815	48355.843	99297.913	4368.308
871003	1300	48355.853	99297.720	4368.283
871004	1442	48355.838	99297.799	4368.280
871004	1620	48355.845	99297.834	4368.283
871004	1710	48355.832	99297.890	4368.317
871009	1210	48355.773	99297.954	4368.289
871009	1640	48355.782	99297.954	4368.255
871014	1350	48355.757	99297.987	4368.224
871017	1420	48355.745	99297.838	4368.230
871017	1515	48355.737	99297.906	4368.205
871017	1615	48355.755	99297.884	4368.148
871105	1145	48355.591	99297.975	4368.079
871105	1330	48355.585	99297.929	4368.113
871105	1415	48355.589	99297.861	4368.113
871113	1350	48355.545	99297.983	4368.054
871118	1505	48355.511	99297.970	4368.069
871126	1412	48355.484	99297.991	4367.976
880113	1255	48355.238	99297.826	4367.817

SUMMARY OF DISPLACEMENT MONITORING DATA
OCTOBER TO DECEMBER/1987

SUMMARY FOR PRISM 11

DATA	TIME	NORTH	EAST	ELEV	DATA	TIME	NORTH	EAST	ELEV
870306	1100	48467.391	99287.628	4450.095	870622	1600	48466.418	99288.163	4449.500
870311	1330	48467.348	99287.877	4450.119	870622	1640	48466.400	99288.114	4449.571
870319	1527	48467.318	99287.921	4450.104	870627	1650	48466.406	99288.127	4449.443
870320	1440	48467.280	99287.993	4450.250	870627	1750	48466.257	99287.974	4449.967
870320	1535	48467.316	99287.957	4450.104	870627	1820	48466.523	99288.227	4449.227
870320	1555	48467.322	99287.957	4450.119	870627	1842	48466.414	99289.175	4449.408
870323	1705	48467.278	99288.038	4450.108	870627	1937	48466.390	99288.132	4449.503
870323	1730	48467.294	99287.991	4450.099	870716	915	48466.269	99289.164	4449.441
870323	1800	48467.291	99287.991	4450.111	870722	930	48466.226	99288.137	4449.415
870323	1825	48467.291	99287.991	4450.111	870729	930	48465.428	99289.158	4448.667
870324	1400	48467.307	99287.956	4450.063	870804	930	48466.111	99288.178	4449.497
870324	1620	48467.271	99288.051	4450.099	870806	1245	48466.154	99288.218	4449.187
870324	1645	48467.231	99288.050	4450.096	870806	1820	48466.195	99288.251	4449.312
870324	1710	48467.291	99288.039	4450.099	870806	1845	48465.082	99289.285	4449.375
870402	1225	48467.275	99287.716	4450.111	870806	1915	48466.087	99288.274	4449.263
870408	1400	48467.394	99287.837	4449.587	870806	1940	48465.681	99289.198	4449.398
870410	1648	48467.285	99287.955	4449.861	870806	2005	48466.082	99288.237	4449.226
870412	1800	48467.237	99288.012	4450.243	870807	1400	48465.684	99289.142	4449.295
870423	1113	48467.185	99287.865	4449.933	870807	1615	48466.075	99288.225	4449.306
870429	1230	48467.113	99288.183	4450.035	870807	1655	48466.084	99289.239	4449.309
870505	1240	48467.202	99287.842	4449.743	870807	1725	48466.082	99288.178	4449.295
870505	1823	48467.234	99287.926	4449.616	870807	1755	48465.696	99289.215	4449.274
870505	1849	48467.136	99287.959	4449.868	870817	1015	48466.018	99288.362	4449.123
870505	1913	48467.111	99287.956	4449.952	870817	1419	48466.246	99289.156	4448.449
870505	1939	48467.115	99287.980	4449.966	870817	1455	48466.275	99288.093	4448.265
870513	1502	48467.142	99287.958	4449.676	870817	1520	48466.084	99289.231	4449.194
870513	1807	48467.089	99288.039	4449.907	870823	1320	48465.956	99288.370	4449.117
870513	1827	48467.093	99288.033	4449.695	870823	1440	48465.949	99289.203	4449.177
870513	1849	48467.123	99289.052	4449.788	870823	1520	48465.960	99288.228	4449.168
870513	1911	48467.103	99288.027	4449.860	870823	1550	48465.966	99289.192	4449.156
870520	1320	48466.600	99289.043	4449.721	870823	1620	48465.966	99288.192	4449.156
870520	1620	48466.567	99288.172	4449.786	870831	1130	48465.946	99289.131	4449.759
870520	1645	48466.609	99288.127	4449.673	870831	1643	48465.974	99288.276	4448.939
870520	1700	48466.597	99288.079	4449.721	870831	1710	48465.988	99289.272	4448.984
870520	1715	48466.565	99287.957	4449.835	870831	1742	48465.997	99288.224	4448.931
870526	1306	48466.597	99288.127	4449.549	870908	1145	48465.849	99289.257	4449.837
870526	1642	48466.630	99289.081	4449.406	870908	1739	48465.834	99288.337	4448.902
870526	1708	48466.593	99288.067	4449.576	870908	1744	48465.794	99289.360	4449.964
870526	1730	48466.587	99288.066	4449.549	870908	1839	48465.838	99288.332	4448.929
870526	1750	48466.453	99287.915	4450.025	870908	1836	48465.814	99289.326	4448.965
870604	1350	48466.499	99288.108	4449.662	870909	1535	48465.696	99288.319	4448.670
870604	1835	48466.480	99288.137	4449.686	870909	1805	48465.763	99288.347	4449.833
870604	1920	48466.427	99289.164	4449.645	870909	1840	48465.753	99289.346	4449.868
870612	930	48466.464	99288.136	4449.603	870909	1940	48465.761	99289.323	4449.645
870612	1700	48466.448	99289.093	4449.624	870918	835	48465.694	99288.346	4448.947
870612	1745	48466.456	99288.118	4449.627	870918	1510	48465.712	99289.235	4448.950
870622	1030	48466.424	99289.032	4449.577	870918	1610	48465.693	99288.271	4448.971
870622	1145	48466.424	99288.197	4449.541	870921	1010	48465.667	99288.293	4448.912
870622	1220	48466.431	99289.188	4449.556	871001	1310	48465.587	99288.228	4448.874
870622	1300	48466.432	99288.143	4449.529	871001	1605	48465.573	99289.370	4448.890
870622	1335	48465.421	99289.163	4449.526	871001	1717	48465.570	99288.311	4448.883

SUMMARY OF DISPLACEMENT MONITORING DATA
MARCH-SEPTEMBER/1987

SUMMARY FOR PRISM 11

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DATE	TIME	NORTH	EAST	ELEV
871002	1545	48465.561	99288.382	4448.838
871002	1720	48465.570	99288.334	4448.844
871002	1815	48465.571	99288.370	4448.833
871003	1300	48465.629	99288.171	4448.820
871004	1442	48465.570	99288.263	4448.791
871004	1630	48465.558	99288.310	4448.853
871004	1710	48465.550	99288.321	4448.877
871009	1210	48465.524	99288.475	4448.794
871009	1640	48465.486	99288.401	4448.833
871014	1350	48465.484	99288.377	4448.741
871105	1145	48465.314	99288.366	4448.612
871105	1330	48465.308	99288.402	4448.624
871105	1415	48465.309	99288.330	4448.636
871113	1350	48465.246	99288.421	4448.618
871118	1505	48465.208	99288.467	4448.595
871126	1412	48465.188	99288.438	4448.497
880113	1255	48464.942	99288.236	4448.277

SUMMARY OF DISPLACEMENT MONITORING DATA
OCTOBER TO DECEMBER/1987

SUMMARY FOR PRISM 12

DATA	TIME	NORTH	EAST	ELEV
870306	1100	48535.805	99296.969	4499.434
870311	1330	48535.775	99297.261	4499.479
870319	1527	48535.705	99297.330	4499.544
870320	1440	48535.715	99297.355	4499.537
870320	1535	48535.715	99297.369	4499.587
870320	1555	48535.731	99297.344	4499.458
870323	1705	48535.693	99297.403	4499.434
870323	1739	48535.712	99297.343	4499.452
870323	1800	48535.706	99297.355	4499.437
870323	1025	48535.706	99297.379	4499.464
870324	1400	48535.719	99297.274	4499.446
870324	1620	48535.703	99297.434	4499.437
870324	1645	48535.707	99297.428	4499.452
870324	1710	48535.703	99297.434	4499.437
870402	1225	48535.695	99297.084	4499.351
870408	1430	48535.806	99297.177	4498.954
870410	1649	48535.715	99297.331	4499.211
870410	1800	48535.653	99297.425	4499.434
870423	1113	48535.639	99297.191	4499.251
870429	1230	48535.581	99297.518	4499.267
870505	1240	48535.648	99297.131	4499.665
870505	1823	48535.626	99297.331	4499.335
870505	1849	48535.573	99297.285	4499.266
870505	1913	48535.544	99297.344	4499.319
870505	1939	48535.557	99297.321	4499.282
870513	1502	48535.563	99297.321	4499.296
870513	1807	48535.501	99297.403	4499.208
870513	1827	48535.518	99297.267	4499.231
870513	1849	48535.542	99297.406	4499.145
870513	1911	48535.519	99297.424	4499.218
870520	1320	48535.478	99297.365	4497.191
870520	1628	48535.433	99297.472	4499.313
870520	1645	48535.485	99297.463	4499.182
870520	1700	48535.468	99297.376	4499.255
870520	1715	48535.425	99297.263	4499.414
870526	1306	48535.423	99297.422	4498.920
870526	1642	48535.427	99297.447	4498.868
870526	1708	48535.385	99297.420	4199.212
870526	1730	48535.395	99297.408	4498.978
870526	1750	48535.283	99297.266	4499.397
870604	1350	48535.198	99297.469	4499.025
870604	1835	48535.282	99297.384	4498.598
870604	1920	48535.184	99297.517	4498.995
870612	930	48535.362	99297.473	4198.756
870612	1700	48535.080	99297.498	4498.874

DATA	TIME	NORTH	EAST	ELEV
870612	1715	48535.363	99297.424	4498.908
870716	915	48534.982	99297.509	4498.490
870722	230	48534.852	99297.433	4198.475
870729	930	48534.808	99297.563	4498.426
870804	930	48534.684	99297.471	4498.488
870806	1245	48534.744	99297.526	4498.184
870806	1820	48534.692	99297.584	4498.335
870806	1845	48534.657	99297.594	4498.415
870806	1915	48534.671	99297.619	4498.366
870906	1940	48534.639	99297.592	4498.476
870806	2005	48534.672	99297.546	4498.378
870807	1400	48534.656	99297.459	4498.333
870807	1615	48534.644	99297.597	4498.342
870807	1655	48534.665	99297.508	4498.308
870807	1725	48534.685	99297.399	4198.299
870807	1755	48534.676	99297.460	4498.284
870817	1015	48534.553	99297.719	4498.196
870817	1418	48534.775	99297.415	4497.575
870817	1455	48534.852	99297.384	4497.371
870817	1520	48534.575	99297.537	4498.187
870823	1320	48534.458	99297.664	4498.233
870823	1440	48534.505	99297.496	4498.158
870823	1520	48534.512	99297.509	4498.126
870823	1550	48534.499	99297.471	4498.175
870823	1620	48534.537	99297.472	4498.153
870831	1130	48534.486	99297.421	4497.794
870831	1643	48534.444	99297.566	4497.931
870831	1710	48534.439	99297.553	4497.983
870831	1742	48534.453	99297.535	4497.916
870908	1145	48534.399	99297.476	4497.791
870908	1700	48534.324	99297.627	4497.935
870908	1744	48534.321	99297.619	4497.975
870908	1839	48534.335	99297.583	4497.928
870908	1836	48534.335	99297.593	4497.938
870909	1505	48534.417	99297.601	4497.719
870909	1805	48534.299	99297.642	4498.888
870909	1841	48534.287	99297.653	4498.945
870909	1940	48534.308	99297.618	4498.868
870918	835	48534.265	99297.625	4497.945
870918	1518	48534.262	99297.513	4498.042
870918	1613	48534.226	99297.552	4197.557
870921	1010	48534.180	99297.595	4497.930
871001	1310	48534.196	99297.574	4497.801
871001	1605	48534.172	99297.627	4497.897
871001	1717	48534.308	99297.616	4197.898

SUMMARY OF DISPLACEMENT MONITORING DATA
MARCH-SEPTEMBER/1987

SUMMARY FOR PRISM 12

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DATE	TIME	NORTH	EAST	ELEV
871002	1545	48534.021	99297.685	4497.815
871002	1720	48534.088	99297.653	4497.808
871002	1815	48534.090	99297.653	4497.836
871003	1300	48534.103	99297.482	4497.796
871004	1443	48534.067	99297.566	4497.827
871004	1620	48534.073	99297.566	4497.842
871004	1710	48534.070	99297.683	4497.842
871009	1210	48533.979	99297.744	4497.803
871009	1640	48534.010	99297.709	4497.812
871014	1350	48533.986	99297.671	4497.763
871017	1420	48533.987	99297.585	4497.641
871017	1515	48533.943	99297.619	4497.776
871017	1615	48533.954	99297.620	4497.739
871105	1145	48533.811	99297.647	4497.587
871105	1330	48533.794	99297.671	4497.636
871105	1415	48533.789	99297.609	4497.633

SUMMARY OF DISPLACEMENT MONITORING DATA
OCTOBER TO DECEMBER/1987

APPENDIX IV

VIBRATION MONITORING DATA

SERIAL NO.: 0111
CLIENT'S NAME: SRLL
USER'S NODE: RII
USER'S FIRM: SRLL
LOCATION: MI.(
RANGE SELECT: 1 in/s 25 mm/s
TRIGGER SOURCE: Geo
TRIGGER LEVEL: 0.07 in/s 1.8 mm/s
RECORD TIME: 1 Sec.

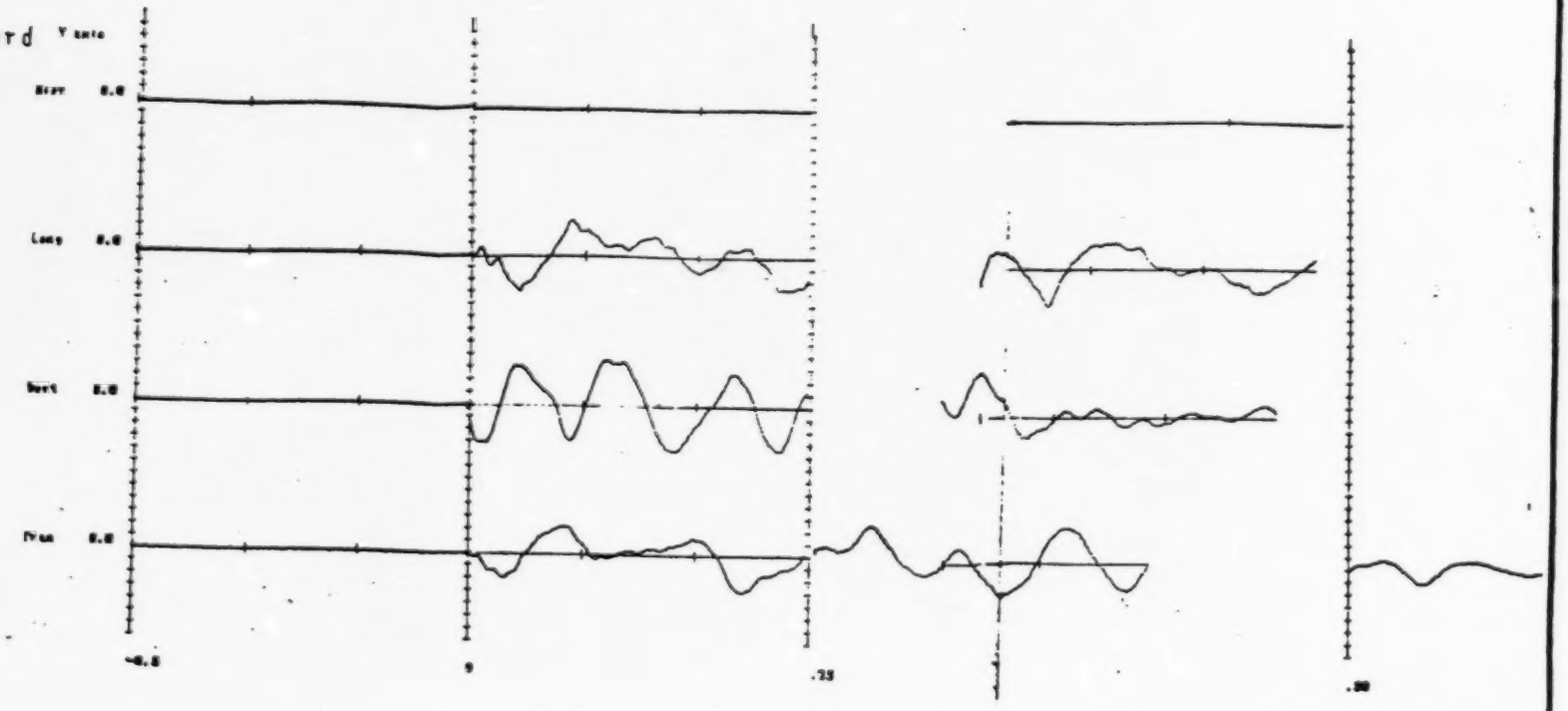
Triggered on: Vert chan.
12:14:29
02/10/07 (m/d/y)

PSPL: < 110 dB

PPV:
Tran 12.00 mm/s
436 ms 11 hz
Vert 15.00 mm/s
101 ms 10 hz
Long 13.00 mm/s
302 ms 8 hz

PVS: (19.84 mm/s)

Blast Record
3715-10



SERIAL NO.: 0111
CLIENT'S NAME: SMOKY
USER'S NAME: J.MCFOUR
USER'S FIRM: CITEMI
LOCATION: M1.1
RANGE SELECT: 2 in/s 51 mm/s
TRIGGER SOURCE: Geo
TRIGGER LEVEL: 0.20 in/s 5.1 mm/s
RECORD TIME: 2 Sec.

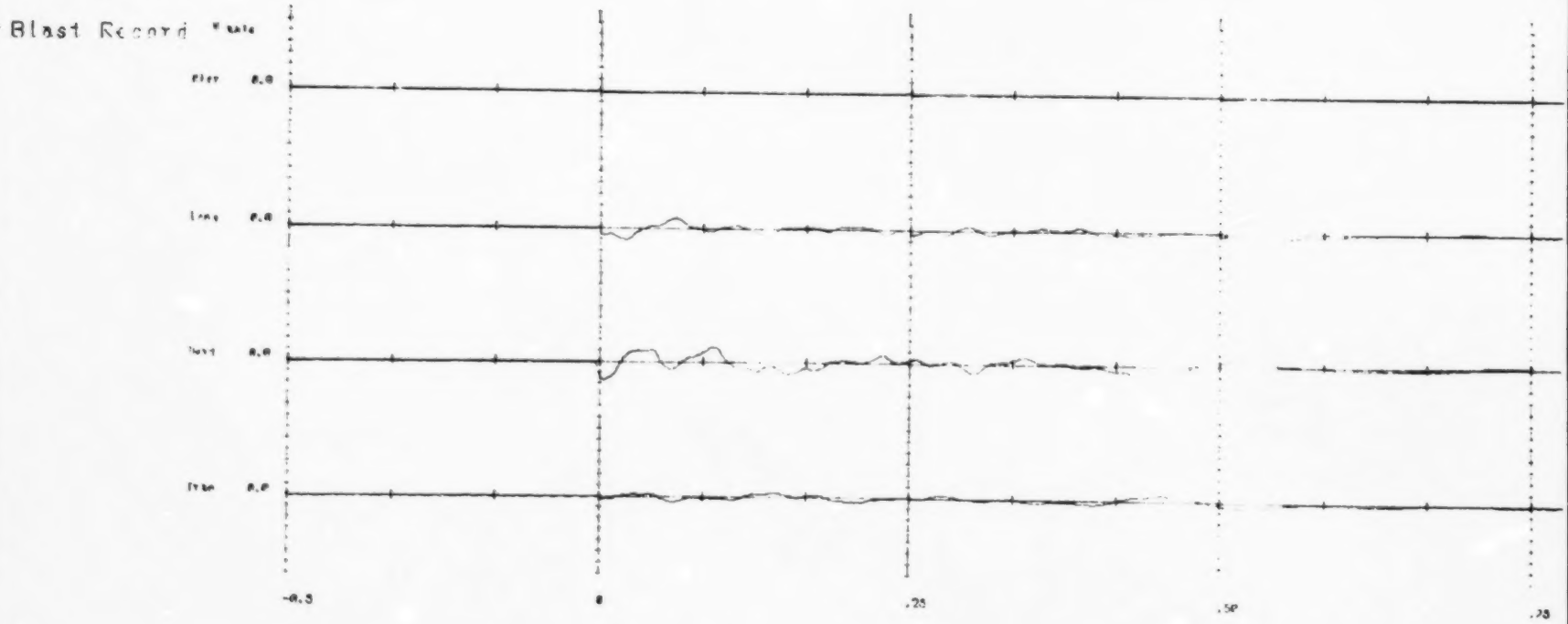
Triggered on: Vert chan.
16:53:40
89/08/07 (m/d/y)

PSPL: < 110 dB

PPV:
Tran 5.20 mm/s
452 ms 6 hz
Vert 13.20 mm/s
4 ms 15 hz
Long 8.80 mm/s
82 ms 10 hz

PVS: 14.00 mm/s

Scale:
X axis 0.0833 s/div
Y axis
Micr: 12.5 psi/div
Geo: 0.164 mm/s/div



$V_t = \frac{y_t}{gain} = \frac{0.75 \text{ in/sec}}{1} = 0.75 \text{ in/sec}$

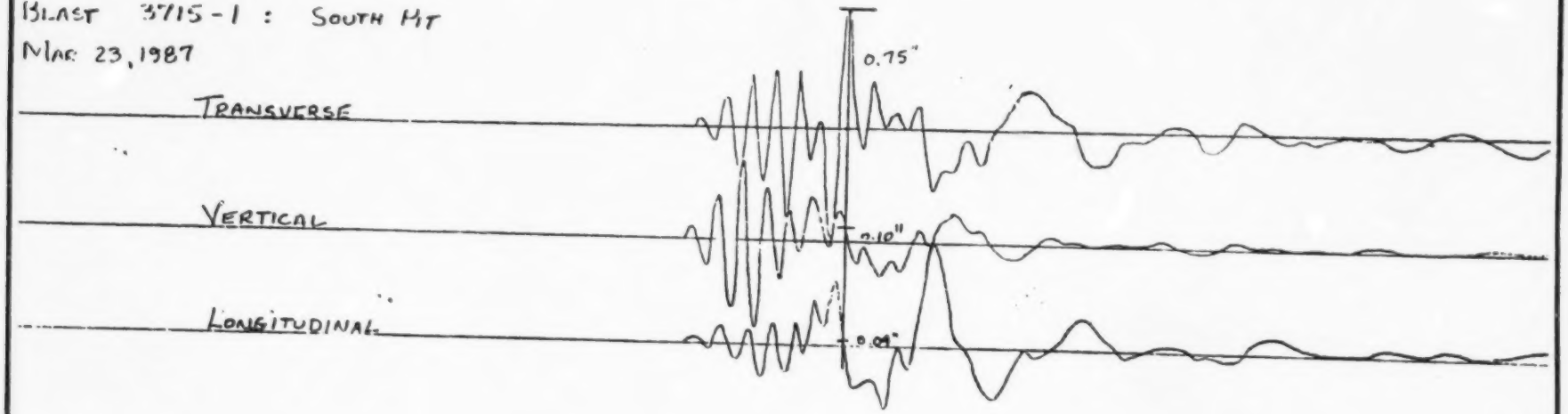
$V_v = \frac{y_v}{gain} = \frac{0.10 \text{ in/sec}}{1} = 0.10 \text{ in/sec}$

$V_L = \frac{y_L}{gain} = \frac{0.04 \text{ in/sec}}{1} = 0.04 \text{ in/sec}$

$V_p = \sqrt{0.75 + 0.10 + 0.04} \text{ in/sec} = \underline{\underline{0.94 \text{ in/sec}}}$

BLAST 3715-1 : SOUTH MT

MAR 23, 1987



CLIENT'S NAME: SRCL
USER'S NAME:
USER'S FIRM: SRCL
LOCATION: M1.1
RANGE SELECT: 1 in/s 25 mm/s
TRIGGER SOURCE: Geo
TRIGGER LEVEL: 0.07 in/s 1.8 mm/s
RECORD TIME: 1 Sec.

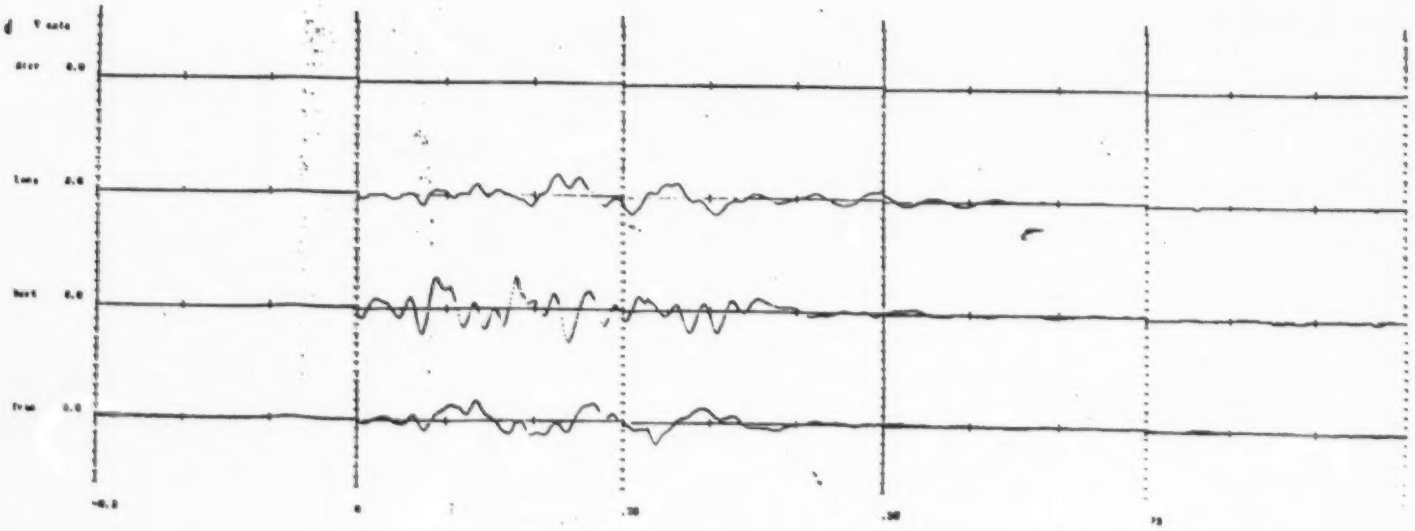
Triggered on: Vert chan.
16:12:11
04/10/07 (m/d/y)

PSPL: < 110 dB

PPV:
Tran 9.80 mm/s
203 ms 8 hz
Vert 14.80 mm/s
199 ms 28 hz
Long 9.80 mm/s
188 ms 9 hz

MVS: 16.00 mm/s

ast Record
3715-11



SERIAL NO.:	0111
CLIENT'S NAME:	SRCL
USER'S NAME:	R. MASON
USER'S FIRM:	SRCL
LOCATION:	SOUTH PIT MI DUMP
RANGE SELECT:	0.5 in/s 13 mm/s
TRIGGER SOURCE:	Geo
TRIGGER LEVEL:	0.04 in/s 1.0 mm/s
RECORD TIME:	1 Sec.

Triggered on: Vert chan.
17:20:00
06/04/87 (m/d/y)

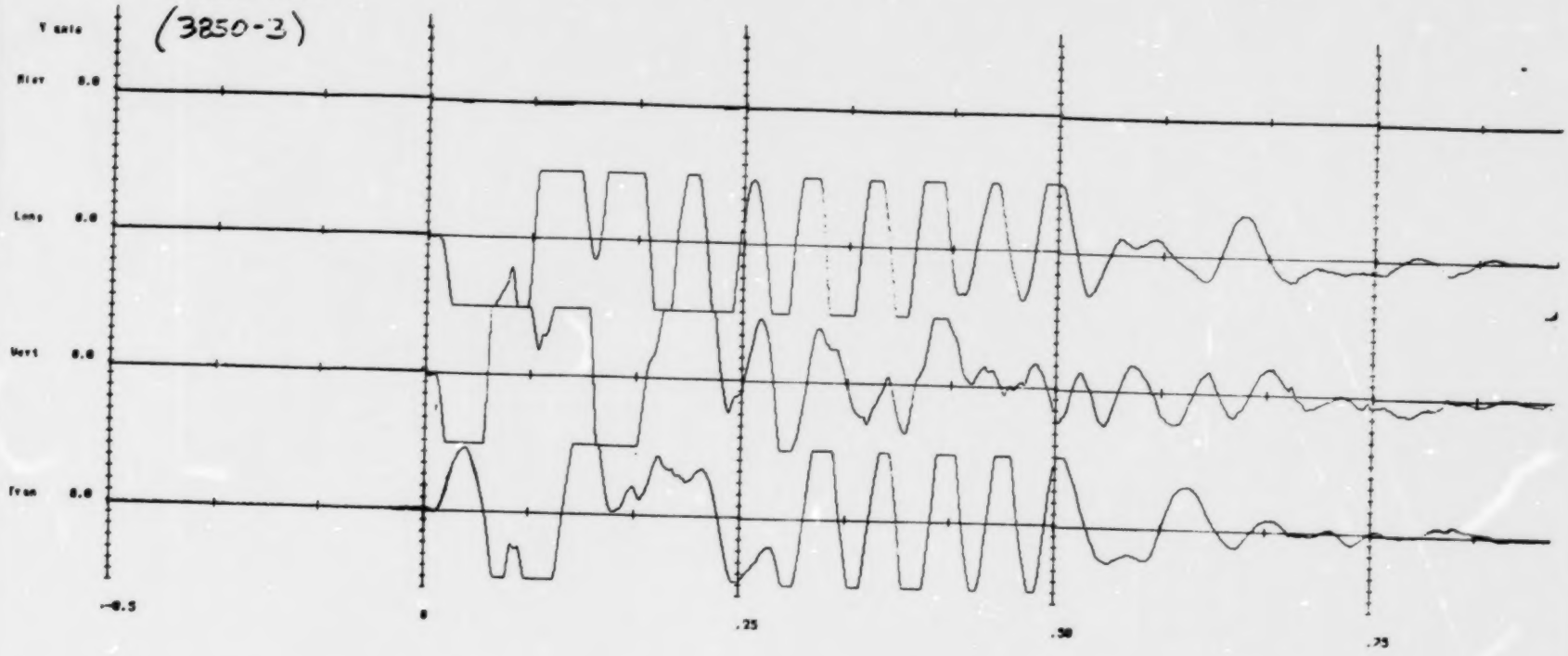
PSPL: < 110 dB

PPV:

Tran	.49 in/s		
	57 ms	5 hz	
Vert	.49 in/s		PPV > .86
	18 ms	8 hz	
Long	.49 in/s		
	22 ms	8 hz	

PVS: .86 in/s

Blast Record
(3250-3)



SERIAL NO.: 0111
CLIENT'S NAME: SRCL
USER'S NAME: R MASON
USER'S FIRM: SRCL
LOCATION: SOUTH PIT M1
RANGE SELECT: 0.5 in/s 13 mm/s
TRIGGER SOURCE: Geo
TRIGGER LEVEL: 0.04 in/s 1.0 mm/s
RECORD TIME: 1 Sec.

Triggered on: Vert shwd.
16:40:48
06/12/87 (m/d/y)

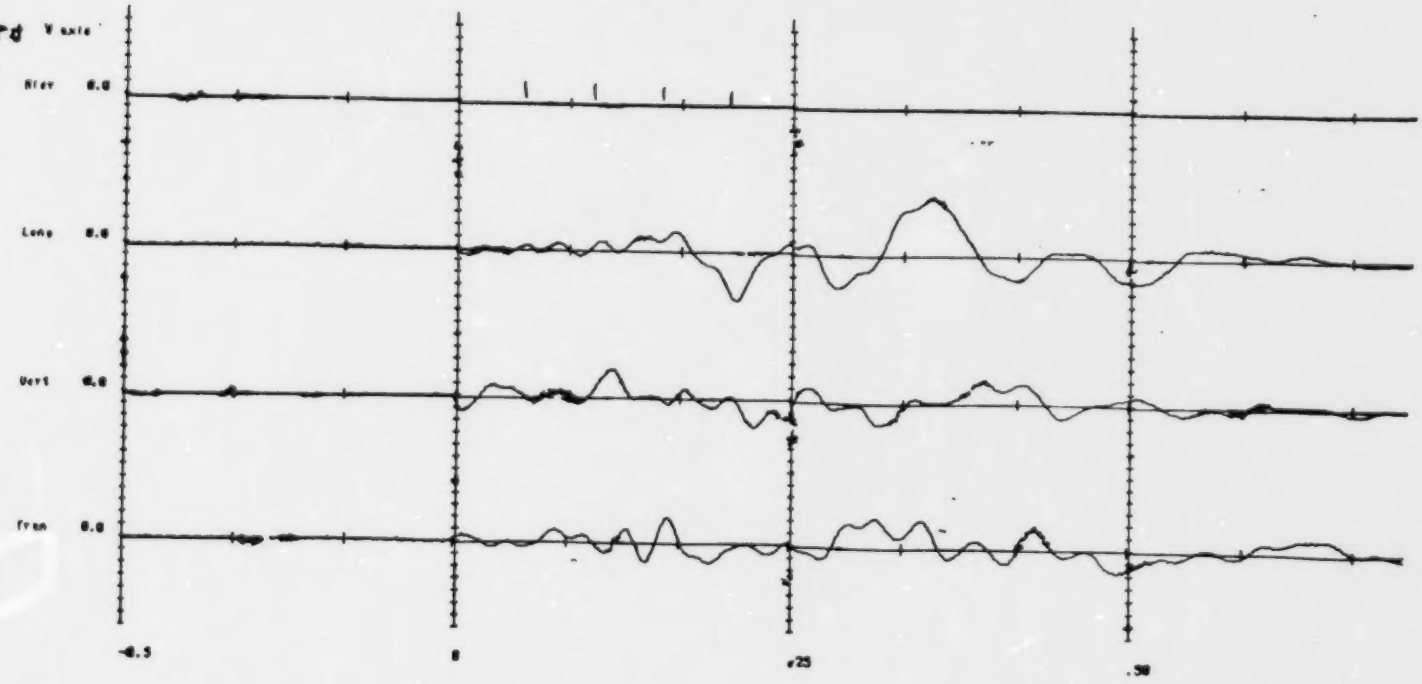
PSPL: < 110 dB

PPV:

Tran	.200	in/s	
	312	ms	10 Hz
Vert	.200	in/s	
	116	ms	19 Hz
Long	.40	in/s	
	355	ms	8 Hz

PVS: .42 in/s

Blast Record (3625-1)



SERIAL NO.:	0111
CLIENT'S NAME:	SRCL
USER'S NAME:	DJB
USER'S FIRM:	KOMEX
LOCATION:	M1 DUMP
RANGE SELECT:	8 in/s 203 mm/s
TRIGGER SOURCE:	Geo
TRIGGER LEVEL:	0.50 in/s 12.7 mm/s
RECORD TIME:	3 Sec.

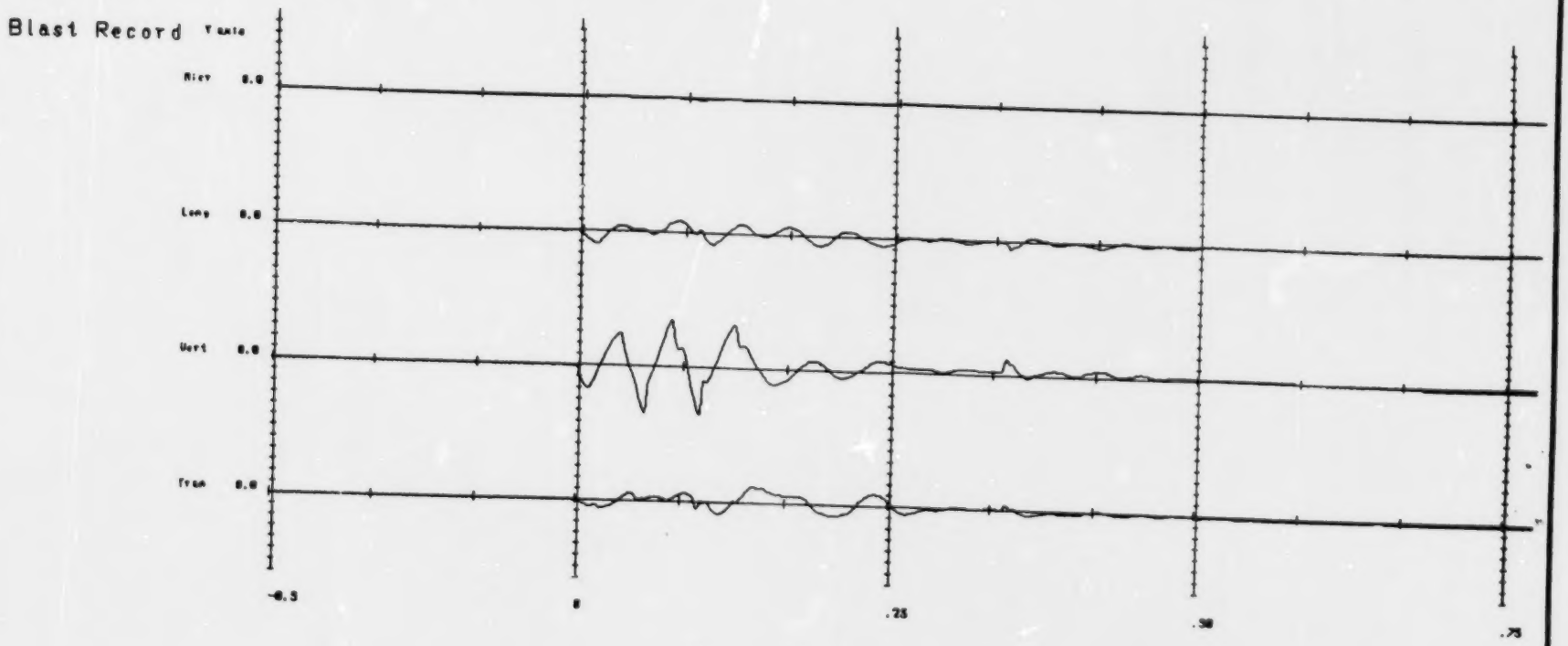
Triggered on: Vert chan.
15:49:06
03/02/07 (m/d/y)

PSPL: < 110 dB

PPV:

Tran	2.014 in/s	
	140 ms	10 hz
Vert	5.66 in/s	
	78 ms	21 hz
Long	1.574 in/s	
	11 ms	16 hz

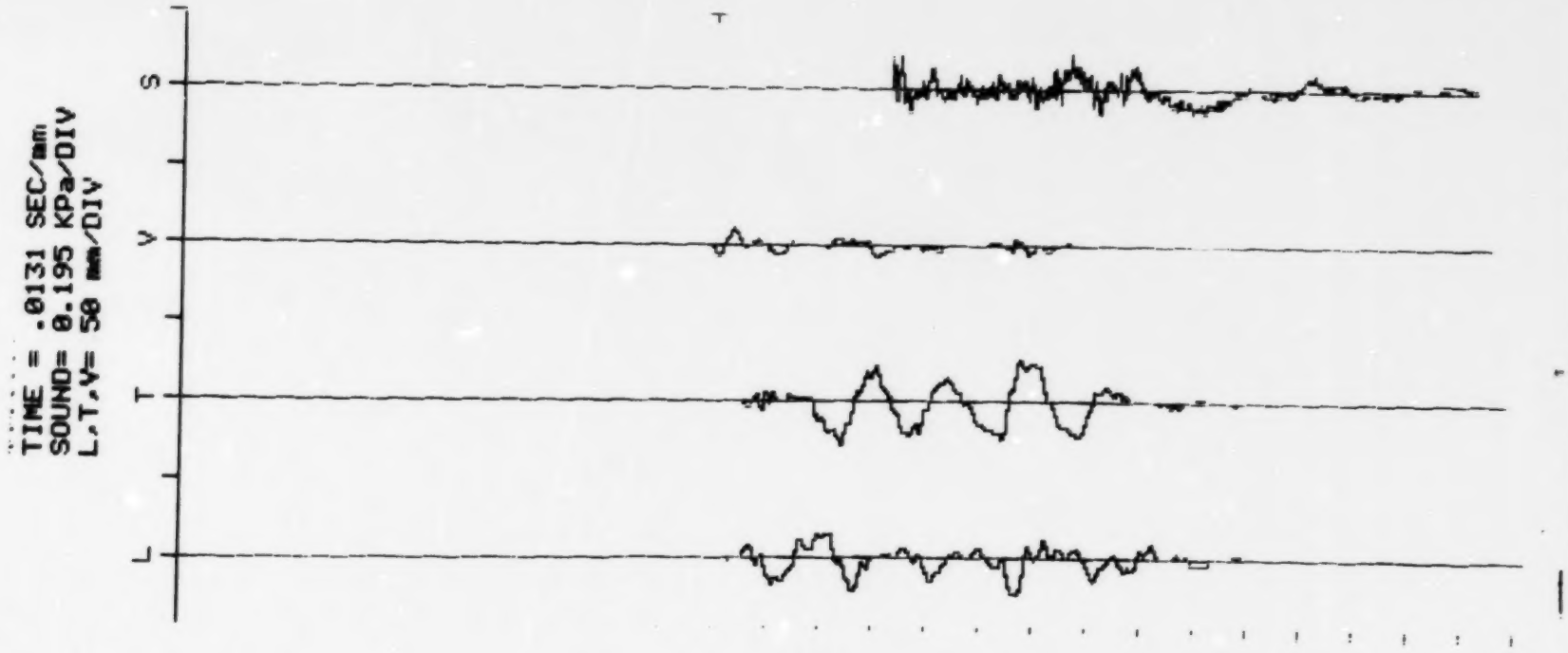
PVS: 5.84 in/s



SEPT 8, 1987

********** MCSC 5200-M/T/A **********
RM /9/?) 5:54:24
INSTRUMENT # MCSC 5218M/T-138
EVENT # 002
COPY # 2
CUSTOMER: SMOKY RIVER COAL
LOCATION: M1.2
OPERATOR: J. BALFOUR
COMPANY: PITEAU
SEIS TRIG LVL (mm/s): 2
SOUND TRIG LEVEL (dB): 140
RECORD TIME (Sec): 5
PRINT (Y/N) Y
TAPE EVENTS (Y/N) N

	L	T	V
PPV(mm/s)	23.0	28.0	11.1
PD(mm)	0.4013	0.6586	0.1177
PPA(g)	0.311	0.352	0.166
Frq(Hz)	12.2	6.3	13.8
RPPV(mm/s)	32.8		
PEAK SOUND	133 dB	0.0093 KPa	



SERIAL NO.:	8111
CLIENT'S NAME:	SMOKY RIVER
USER'S NAME:	A.STUCKERT
USER'S FIRM:	PITEAU
LOCATION:	M1.7
RANGE SELECT:	1 in/s 25 mm/s
TRIGGER SOURCE:	Geo
TRIGGER LEVEL:	0.07 in/s 1.8 mm/s
RECORD TIME:	1 Sec.

Triggered on: Vert chan.
17:48:14
09/09/07 (m/d/y)

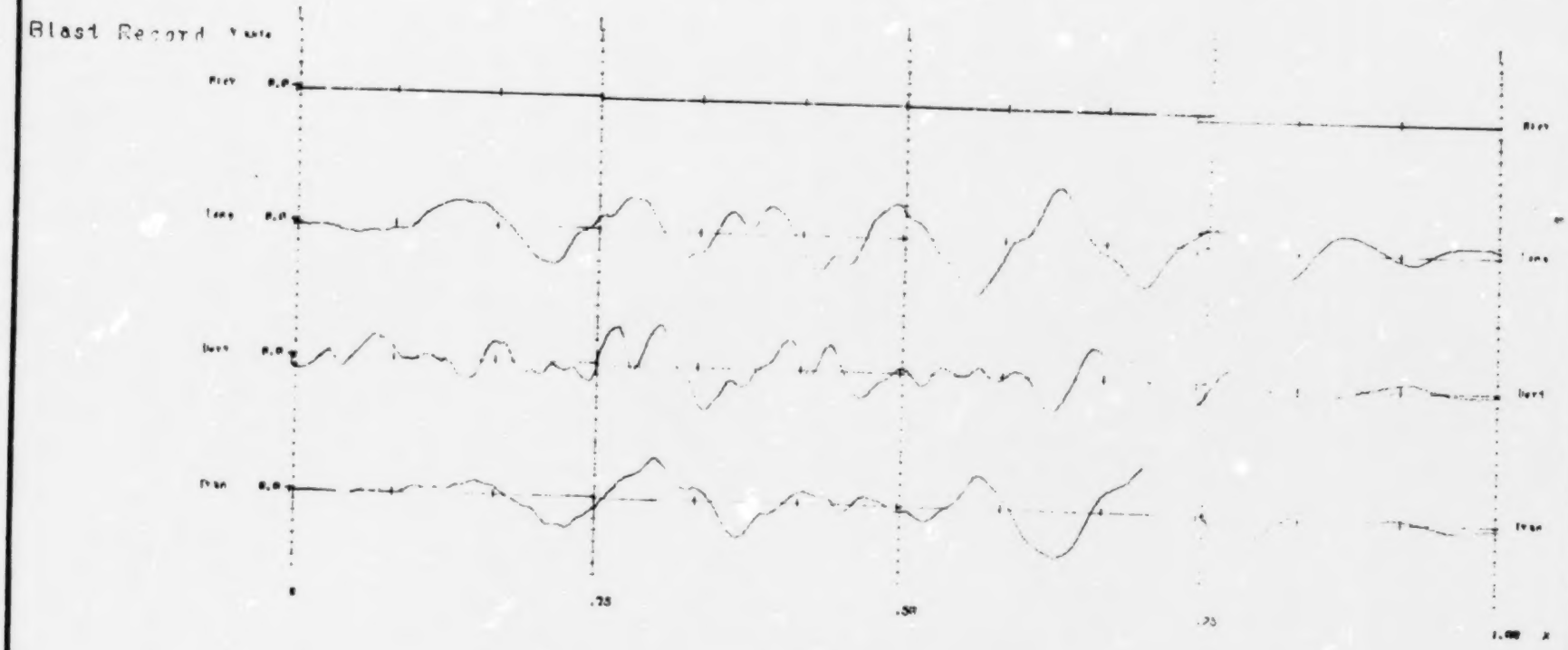
PSPL: < 110 dB

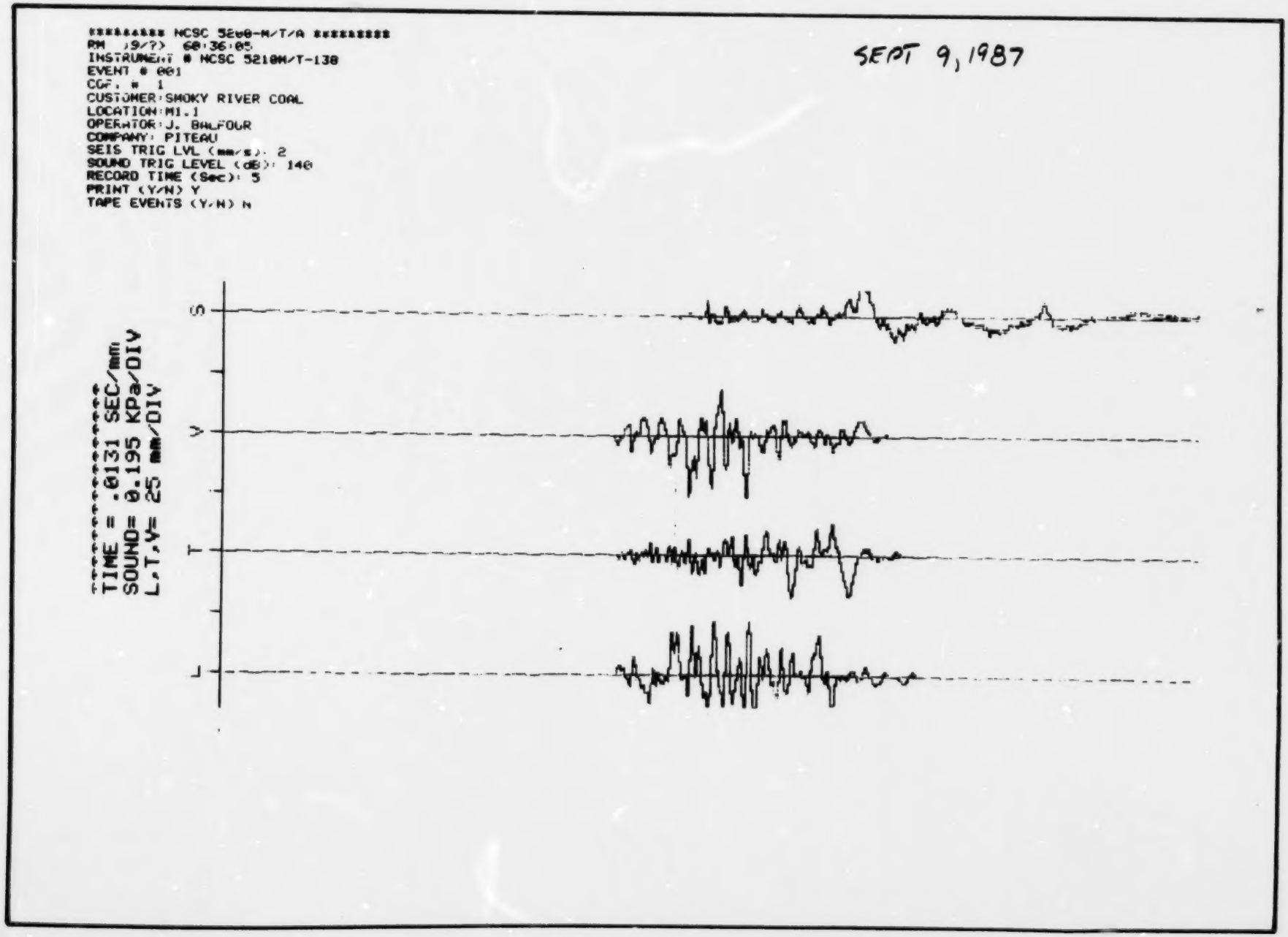
PPV:

Tran	19.70 mm/s		
	207 ms	6	hz
Vert	15.60 mm/s		
	338 ms	3	hz
Long	21.60 mm/s		
	625 ms	2	hz

PVS: 30.14 mm/s

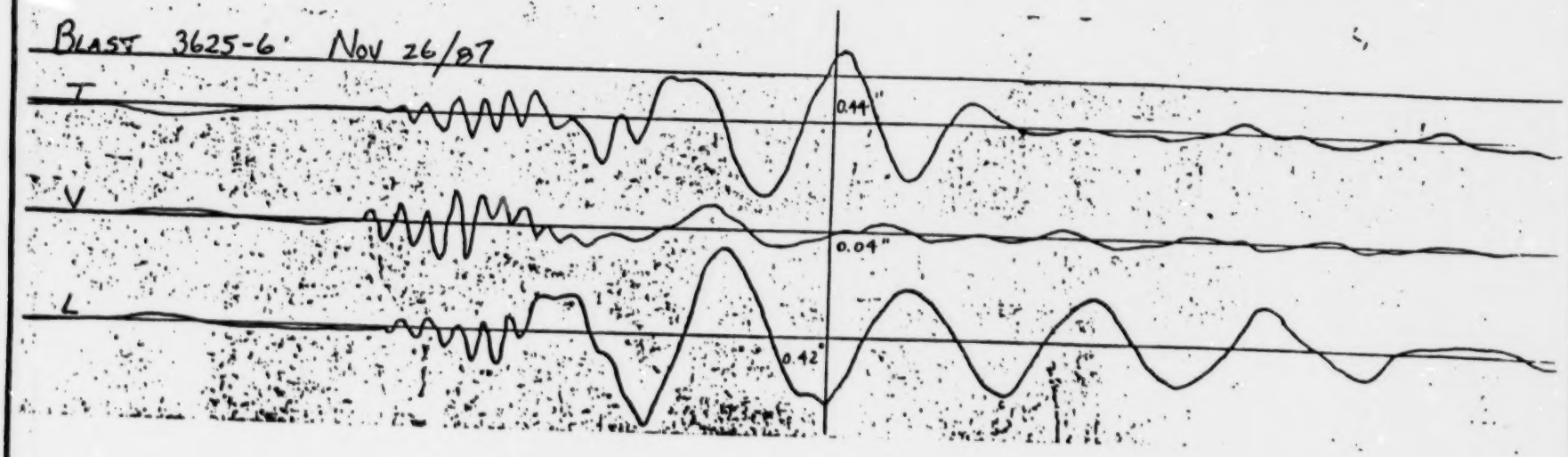
Scale:
X axis 0.0833 s/div
Y axis
Micr: 12.5 pa/div
Geo: 1.732 mm/s/div




********* NCSC 5200-M/T/A **********
RM 09/?? 08:36:05
INSTRUMENT # NCSC 5210M/T-138
EVENT # 001
CONF. # 1
CUSTOMER:SMOKY RIVER COAL
LOCATION:M1.1
OPERATOR:J. BALFOUR
COMPANY: PITEAU
SEIS TRIG LVL (mm/s): 2
SOUND TRIG LEVEL (dB): 140
RECORD TIME (Sec): 5
PRINT (Y/N) Y
TAPE EVENTS (Y/N) N
SEPT 9, 1987
TIME = .0131 SEC/mm
SOUND= 0.195 KPa/DIV
L,T,V= 25 mm/DIV
S
V
T
L

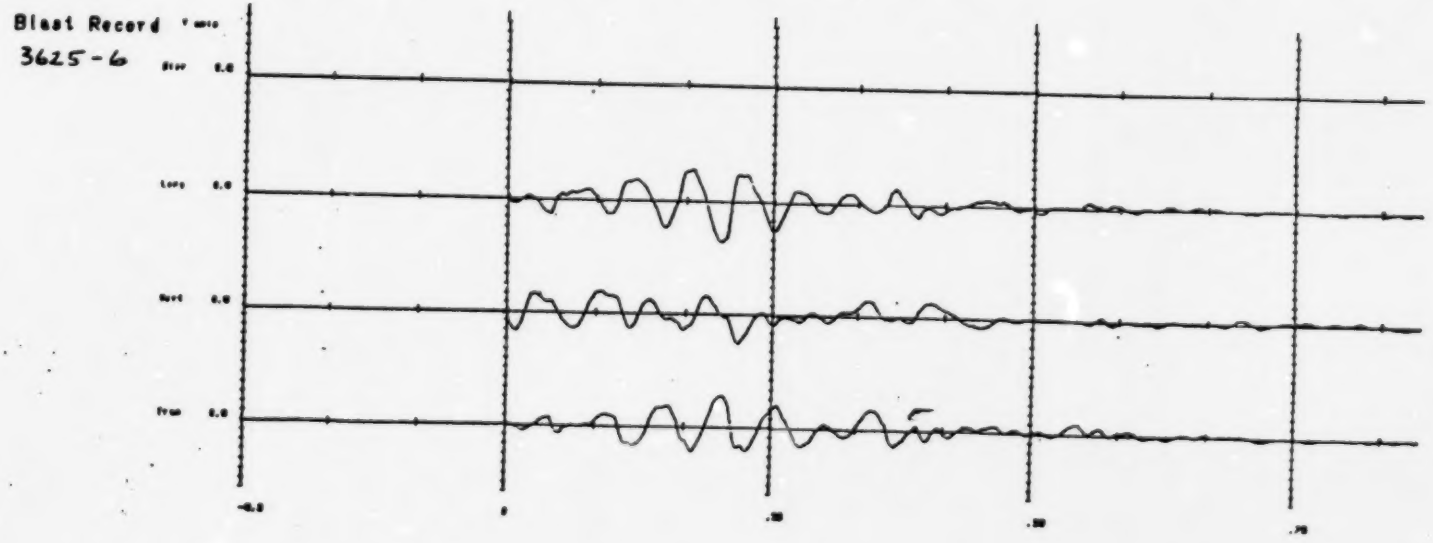
Gain = 1

$$V_p = [(0.44)^2 + (-0.04)^2 + (-0.42)^2]^{1/2}$$
$$= [0.19 + 0.0016 + 0.18]^{1/2}$$
$$= \underline{0.61 \text{ in/sec}}$$



SERIAL NO.:	0111		
CLIENT'S NAME:			
USER'S NAME:	RM		
USER'S FIRM:	SRCL		
LOCATION:	M1.1		
RANGE SELECT:	1 in/s	25 mm/s	
TRIGGER SOURCE:	Geo		
TRIGGER LEVEL:	0.07 in/s	1.8 mm/s	
RECORD TIME:	1 Sec.		

Triggered on:	Vert chan.	
	16:34:53	
	11/26/87	(m/d/y)
PSPL:	< 110 dB	
PPV:		
Tran	14.40 mm/s	
	202 ms	19 hz
Vert	13.20 mm/s	
	218 ms	13 hz
Long	18.00 mm/s	
	201 ms	18 hz
PVS:	22.92 mm/s	

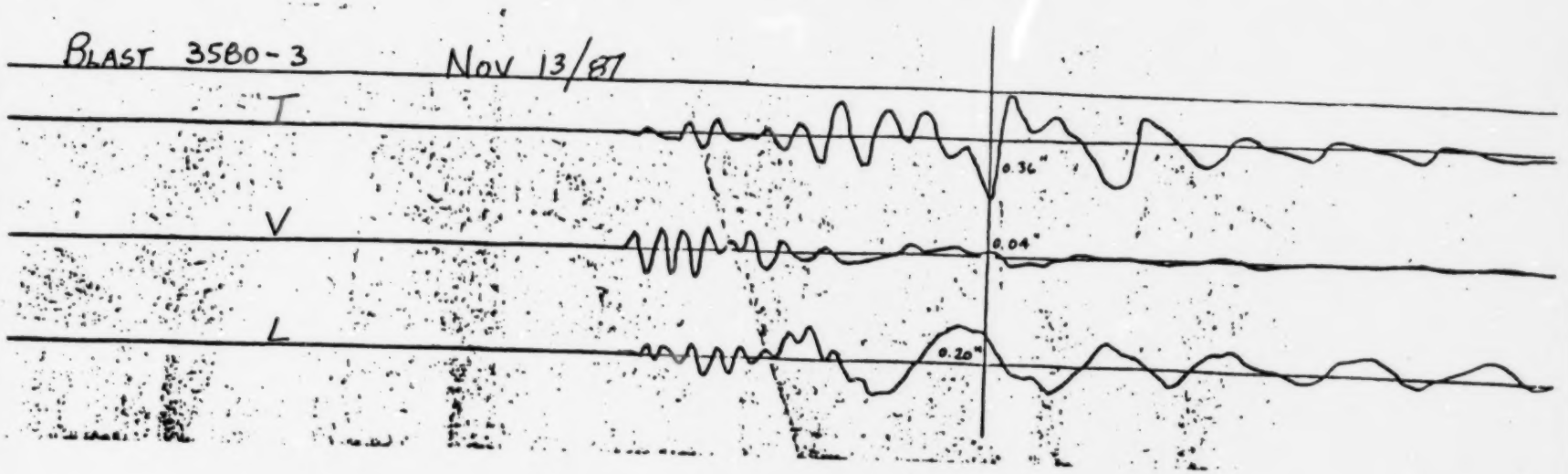


Gain = 1

$$V_p = \left[(-0.36)^2 + (0.04)^2 + (0.20^2) \right]^{1/2} \text{ in/sec}$$

$$= \left[0.13 + 0.0016 + 0.04 \right]^{1/2}$$

$$= \underline{0.41 \text{ in/sec}}$$



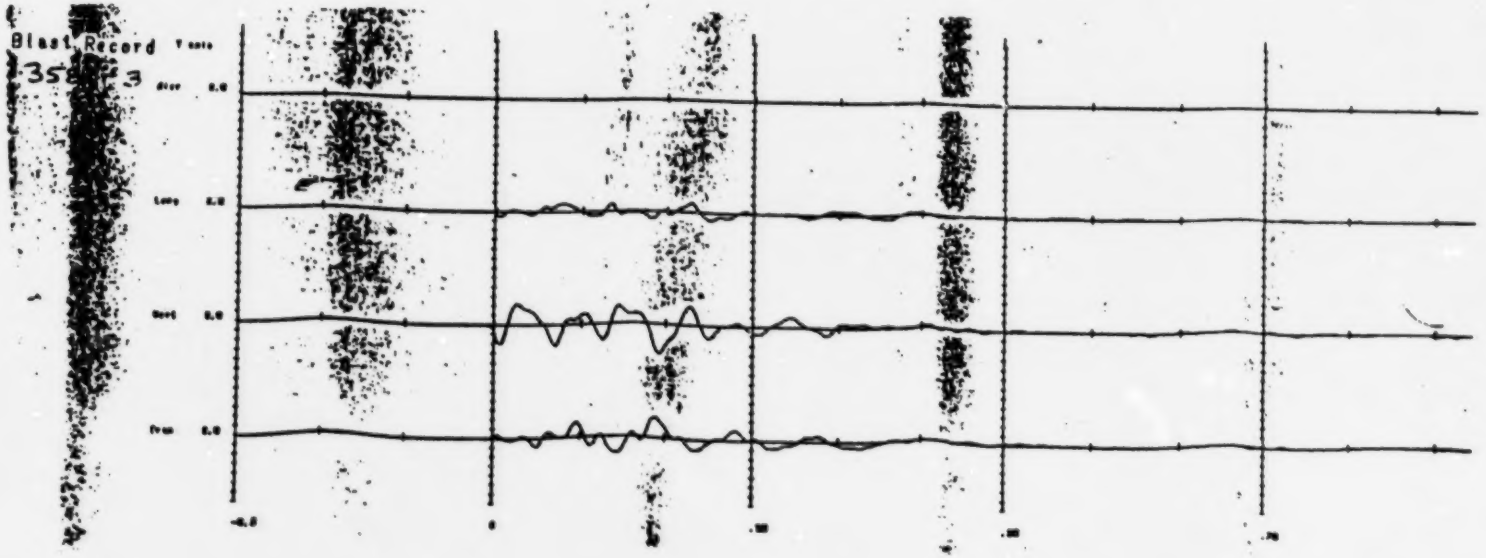
SERIAL NO.: 8111
CLIENT'S NAME: SRCL
USER'S NAME: RM
USER'S FIRM: SRCL
LOCATION: [illegible]
RANGE SELECT: [illegible] in/s [illegible] mm/s
TRIGGER SOURCE: Geo
TRIGGER LEVEL: 0.07 in/s 1.8 mm/s
RECORD TIME: 1 Sec.

Triggered on: Vert chan.
16:32:15
11/13/07 (m/d/y)

PSPL: < 110 dB

PPV:
Tran 5.40 mm/s
157 ms 14 hz
Vert 12.80 mm/s
160 ms 13 hz
Long 4.40 mm/s
150 ms 16 hz

PVS: 15.24 mm/s

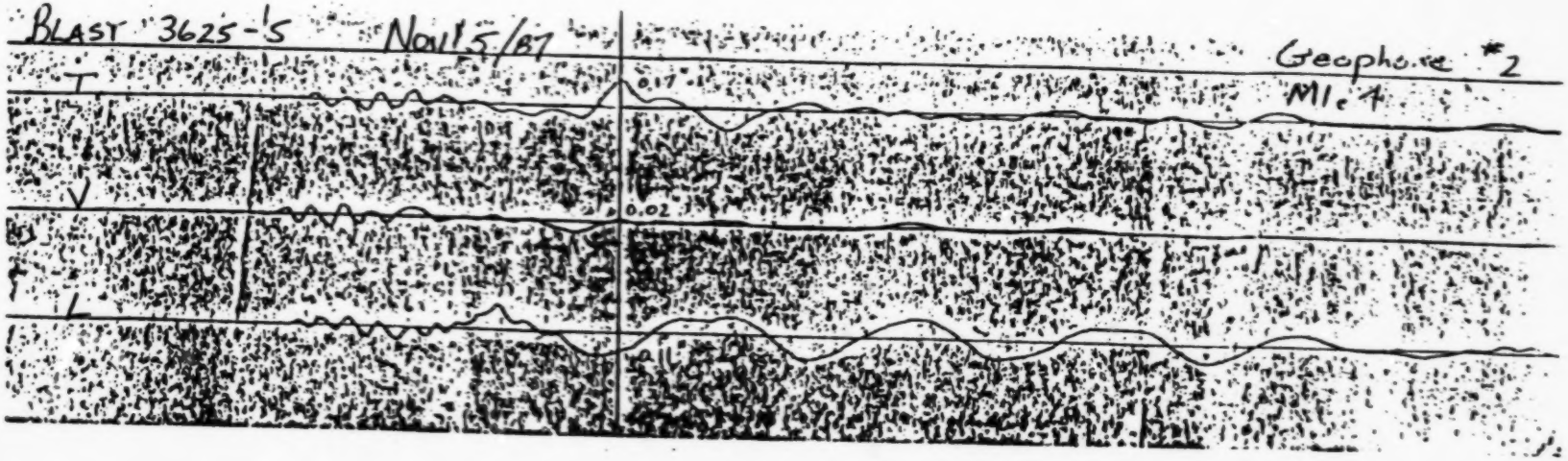


Gain = 1

$$V_P = \left[(0.17)^2 + (0.02)^2 + (-0.11)^2 \right]^{1/2}$$

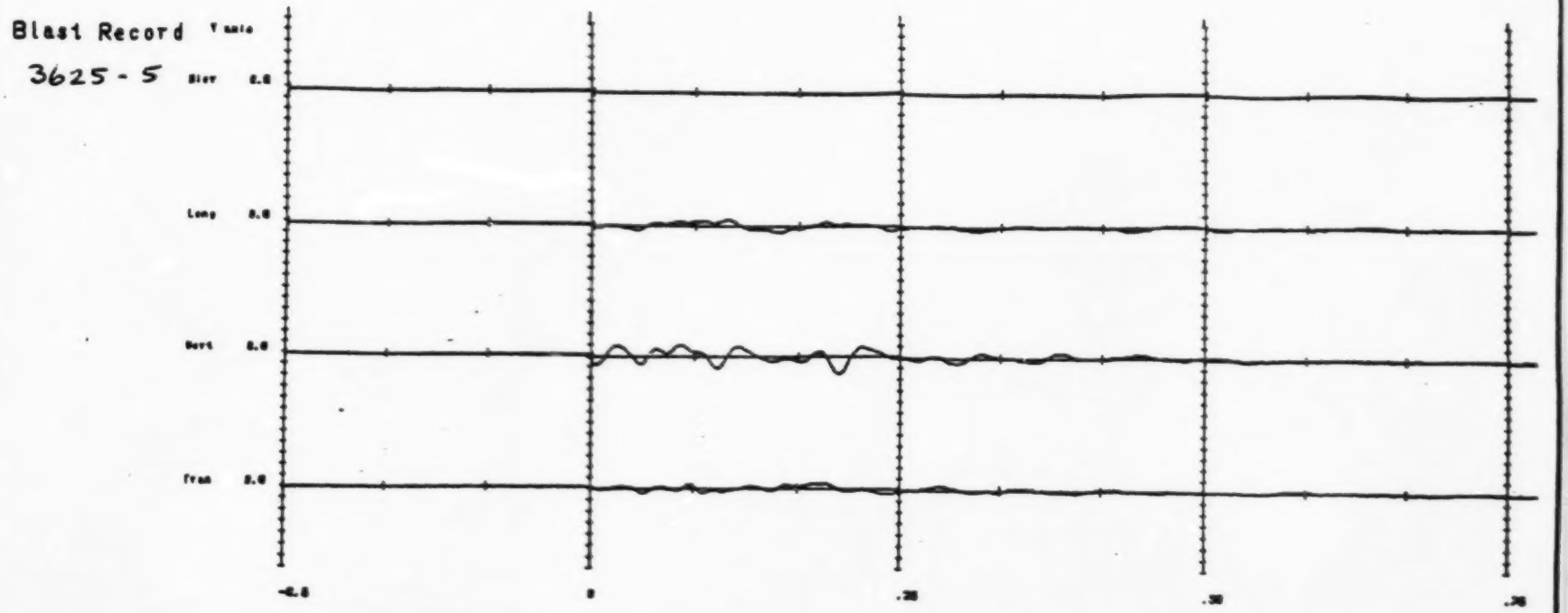
$$= \left[0.03 + 0.0004 + 0.01 \right]^{1/2}$$

$$= \underline{\underline{0.20 \text{ in/sec}}}$$



SERIAL NO.:	0111
CLIENT'S NAME:	SRCL
USER'S NAME:	SRCL
USER'S FIRM:	R.M.
LOCATION:	M1.2
RANGE SELECT:	1 in/s 25 mm/s
TRIGGER SOURCE:	Geo
TRIGGER LEVEL:	0.07 in/s 1.8 mm/s
RECORD TIME:	1 Sec.

Triggered on:	Vert chan.
	13:04:29
	11/05/87 (m/d/y)
PSPL:	< 110 dB
PPV:	
Tran	2.00 mm/s
	178 ms 10 hz
Vert	6.40 mm/s
	199 ms 10 hz
Long	2.80 mm/s
	103 ms 7 hz



CLIENT'S NAME: SRCL
USER'S NAME: GS
USER'S FIRM: SRCL
LOCATION: MI UPPER (NEW) (MI.2)
RANGE SELECT: 1 in/s 25 mm/s
TRIGGER SOURCE: Geo
TRIGGER LEVEL: 0.07 in/s 1.8 mm/s
RECORD TIME: 1 Sec.

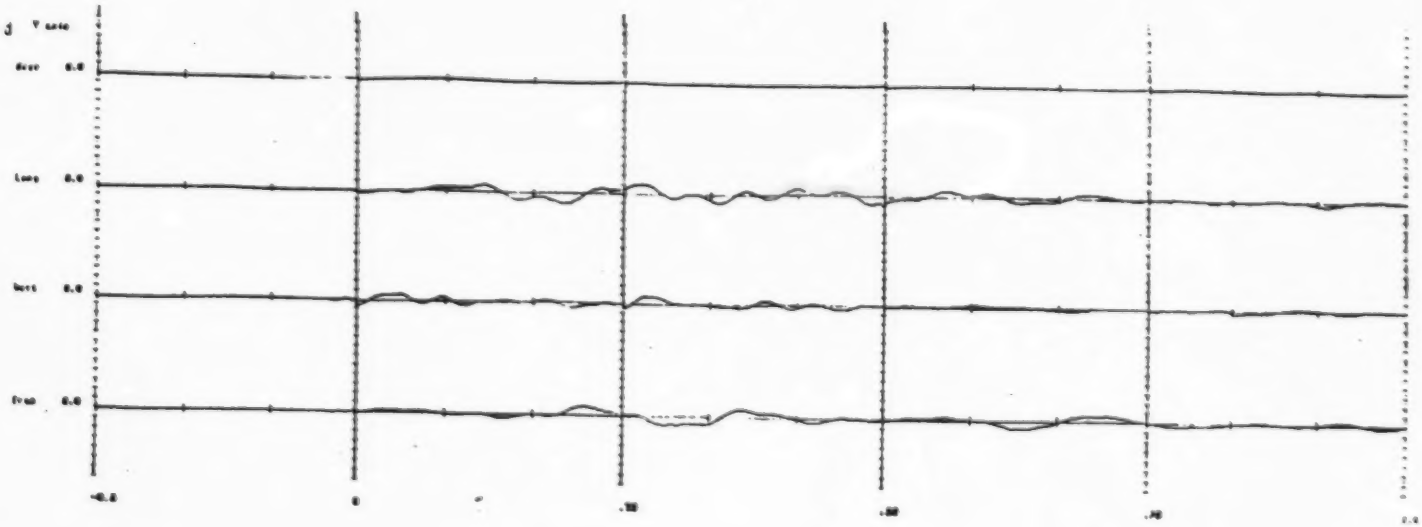
Triggered on: Vert chan.
09:49:51
09/10/87 (m/d/y)

PSPL: < 110 dB

PPV:
Tran 4.40 mm/s
215 ms 6 hz
Vert 4.00 mm/s
273 ms 6 hz
Long 5.00 mm/s
266 ms 6 hz

PVS: 8.20 mm/s

38: Record
3670-6



SERIAL NO.:	0111
CLIENT'S NAME:	SRCL
USER'S NAME:	GS
USER'S FIRM:	SRCL
LOCATION:	Mi[redacted]
RANGE SELECT:	1 in/s 25 mm/s
TRIGGER SOURCE:	Geo
TRIGGER LEVEL:	0.07 in/s 1.8 mm/s
RECORD TIME:	1 Sec.

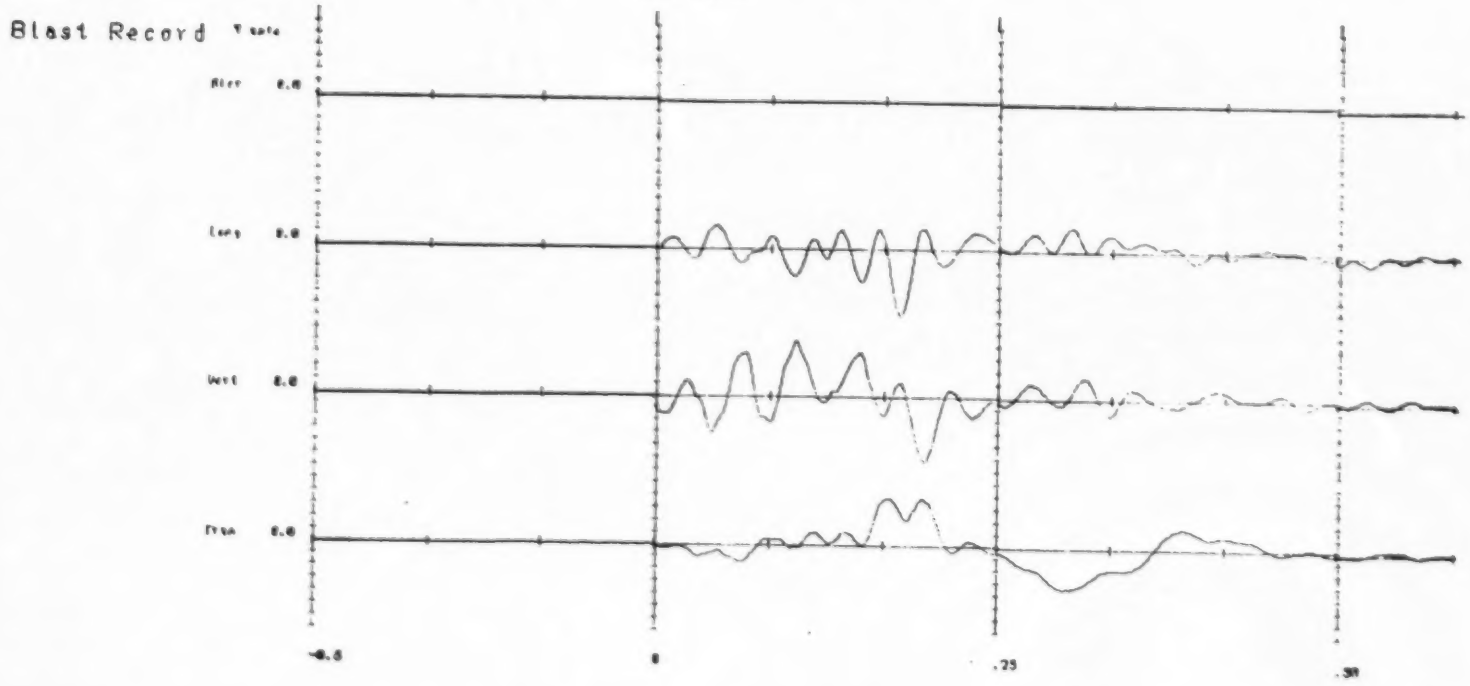
Triggered on: Vert chan.
15:01:18
09/10/07 (m/d/y)

PSPL: < 110 dB

PPV:

Tran	16.60 mm/s	
	170 ms	8 hz
Vert	21.80 mm/s	
	197 ms	25 hz
Long	23.20 mm/s	
	179 ms	29 hz

PVS: 28.10 mm/s
1.11 in/sec



SERIAL NO.: 0111
CLIENT'S NOTE: SRCL
USER'S NOTE: RM
USER'S FIRM: SRCL
LOCATION: M1.1
RANGE SELECT: 1 in/s 25 mm/s
TRIGGER SOURCE: Geo
TRIGGER LEVEL: 0.07 in/s 1.8 mm/s
RECORD TIME: 1 Sec.

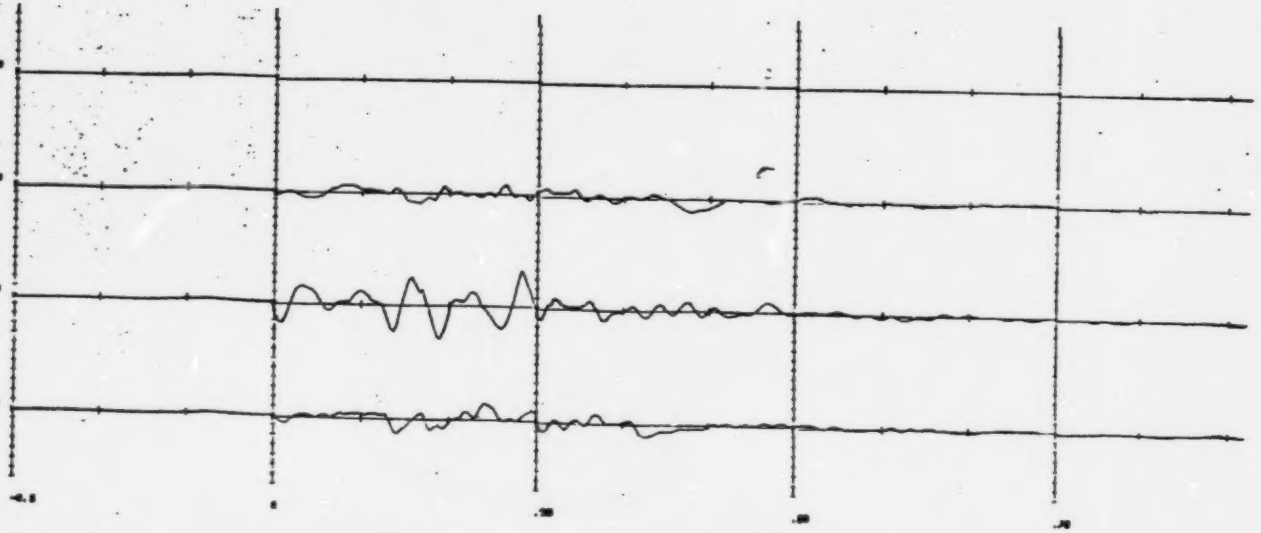
Triggered on: Vert chan.
15:50:52
10/01/07 (m/d/y)

BSEN: < 110 dB

PPV:
Tran 7.10 mm/s
500 ms 10 hz
Vert 16.60 mm/s
236 ms 28 hz
Long 5.40 mm/s
399 ms 9 hz

PVS: 16.80 mm/s

Blast Record
37/5-9



SERIAL NO.:	0111
CLIENT'S NAME:	SRCL
USER'S NAME:	GS
USER'S FIRM:	SRCL
LOCATION:	M1 DUMP M1.1
RANGE SELECT:	1 in/s 25 mm/s
TRIGGER SOURCE:	Geo
TRIGGER LEVEL:	0.07 in/s 1.8 mm/s
RECORD TIME:	1 Sec.

Triggered on: Vert chan.
00:21:45
10/17/87 (m/d/y)

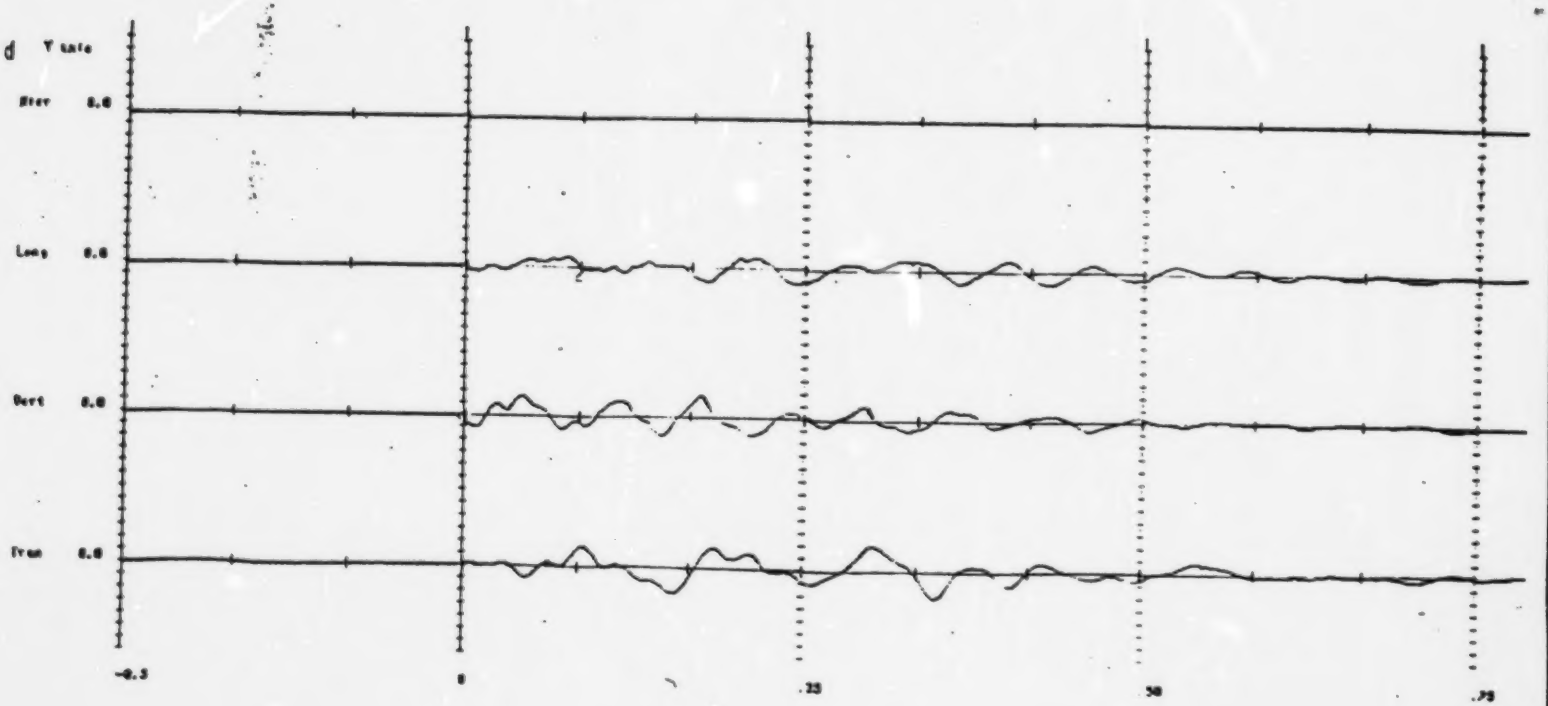
PSPL: < 110 dB

PPV:

Tran	8.80 mm/s	
	383 ms	11 hz
Vert	7.80 mm/s	
	174 ms	13 hz
Long	5.00 mm/s	
	244 ms	8 hz

PVS: 9.40 mm/s

Blast Record
3580-1



SERIAL NO.: 0111
CLIENT'S NAME:
USER'S NAME: R. MASON
USER'S FIRM: SRCL
LOCATION: M1.7
RANGE SELECT: 1 in/s 25 mm/s
TRIGGER SOURCE: Geo
TRIGGER LEVEL: 0.07 in/s 1.8 mm/s
RECORD TIME: 1 Sec.

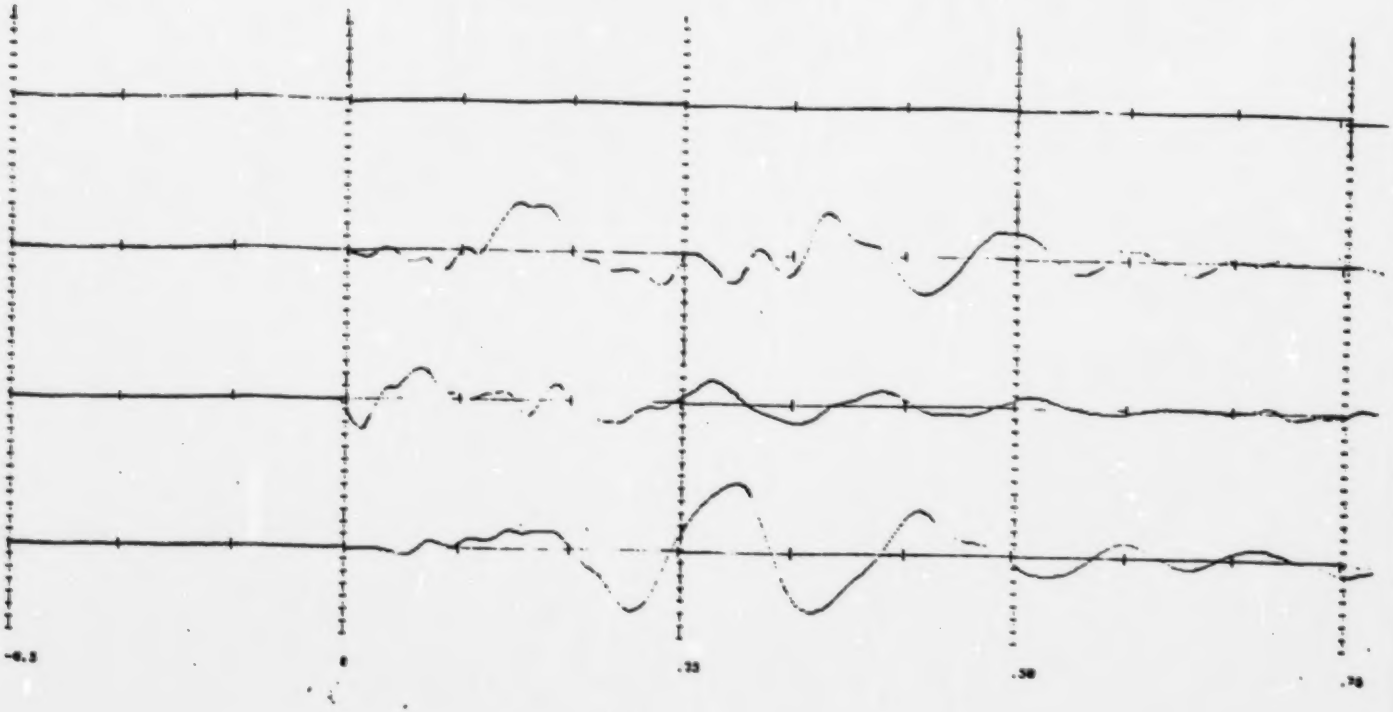
Triggered on: Vert chan.
18:00:51
10/20/87 (m/d/y)

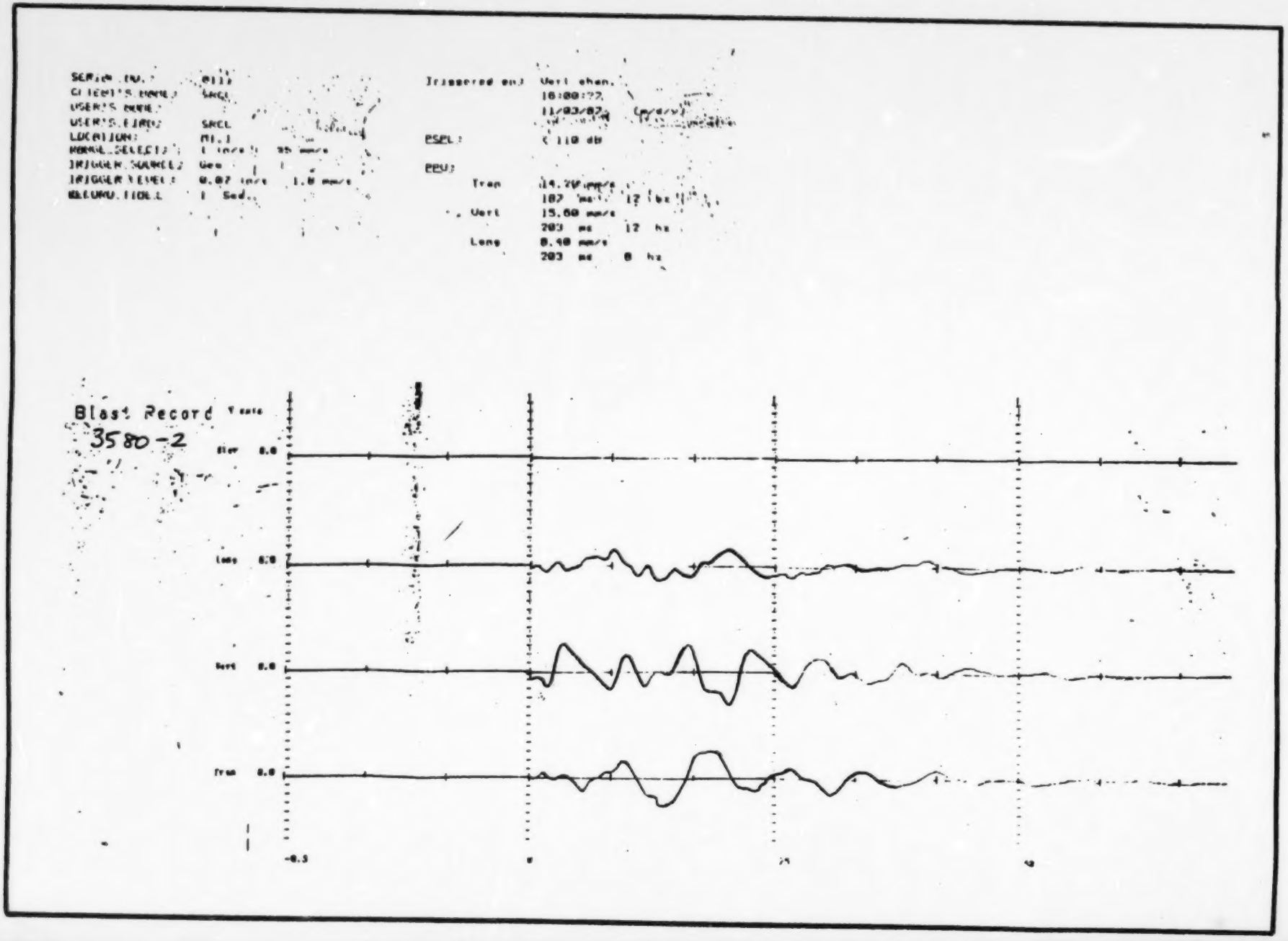
PSPL: (110 dB

PPV:
Tran 23.60 mm/s
291 ms 0 hz
Vert 10.80 mm/s
55 ms 7 hz
Long 16.60 mm/s
127 ms 0 hz

PVS: 23.58 mm/s

Blast Record
3670-10




Triggered on: Vert chan.
16:00:22
11/03/82
PSPL: < 110 dB
PPV:
Tran 14.29 mm/s
187 ms 12 hz
Vert 15.60 mm/s
203 ms 12 hz
Long 8.40 mm/s
203 ms 8 hz
Blast Record
3580-2
Tran
Long
Vert
Tran
-0.3

SERIAL NO.:	0111
CLIENT'S NAME:	SRCL
USER'S NAME:	R.M.
USER'S FIRM:	SRCL
LOCATION:	M1.1
RANGE SELECT:	1 in/s 25 mm/s
TRIGGER SOURCE:	Geo
TRIGGER LEVEL:	0.07 in/s 1.8 mm/s
RECORD TIME:	1 Sec.

Triggered on: Tran chan.
18:40:05
11/18/07 (m/d/y)

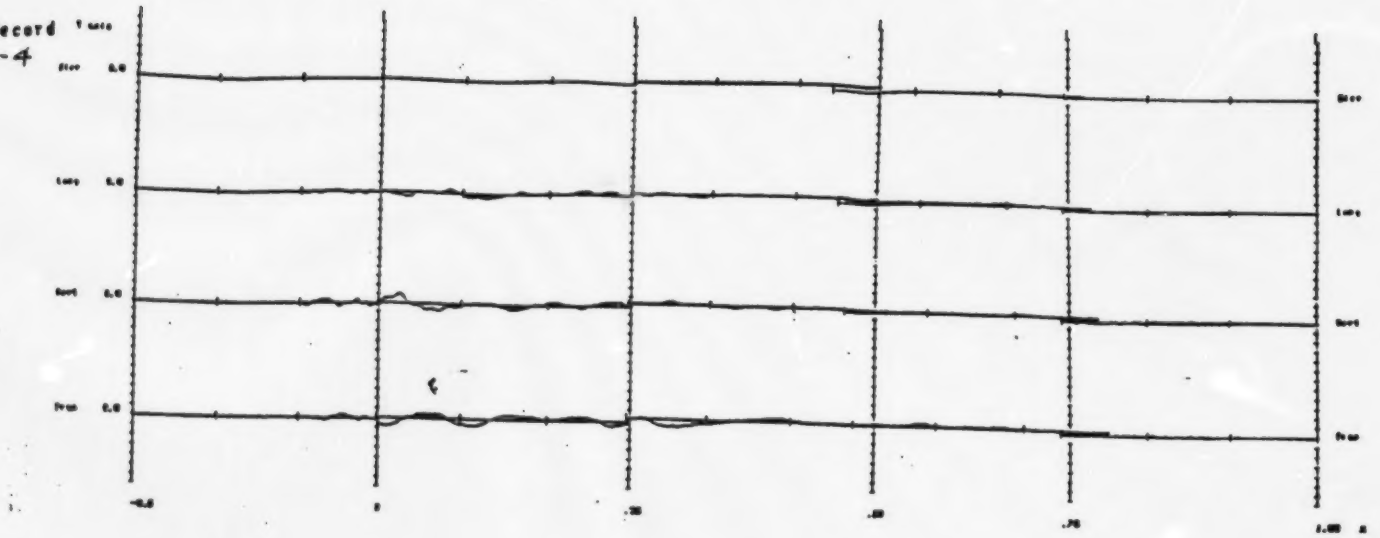
PSPL: < 110 dB

PPV:

Tran	3.00 mm/s	
	10 ms	11 hz
Vert	4.00 mm/s	
	22 ms	11 hz
Long	2.00 mm/s	
	60 ms	10 hz

PVS: 4.70 mm/s

Blast Record
3580-4

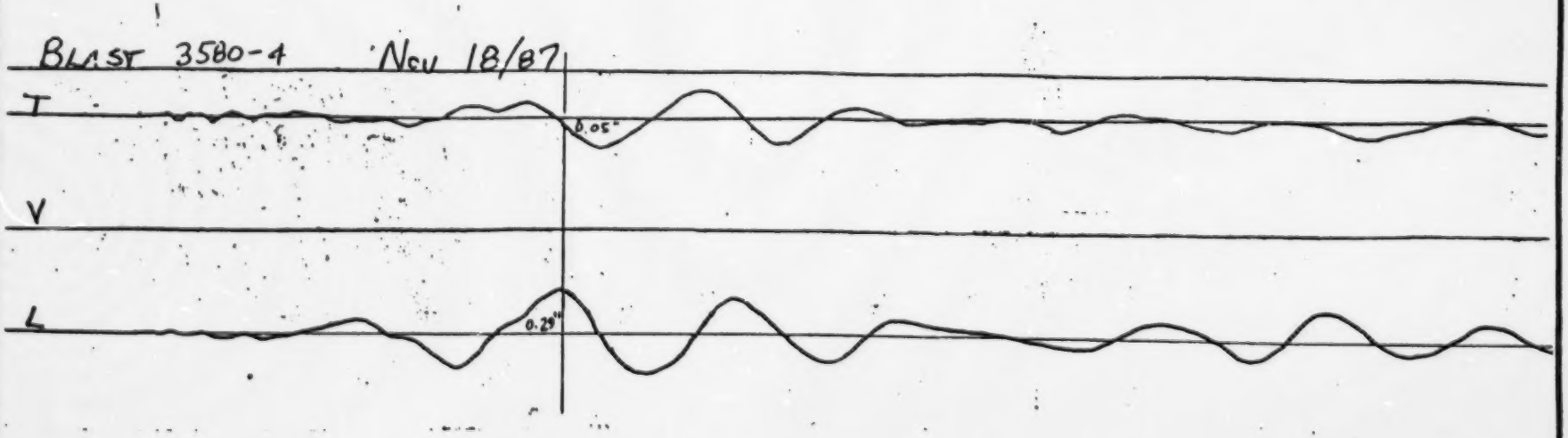


Gain = 1

$$V_p = [(-0.05)^2 + (0)^2 + (0.29)^2]$$

$$= [0.0025 + 0 + 0.08]^{1/2}$$

$$= \underline{0.29 \text{ in/sec}}$$



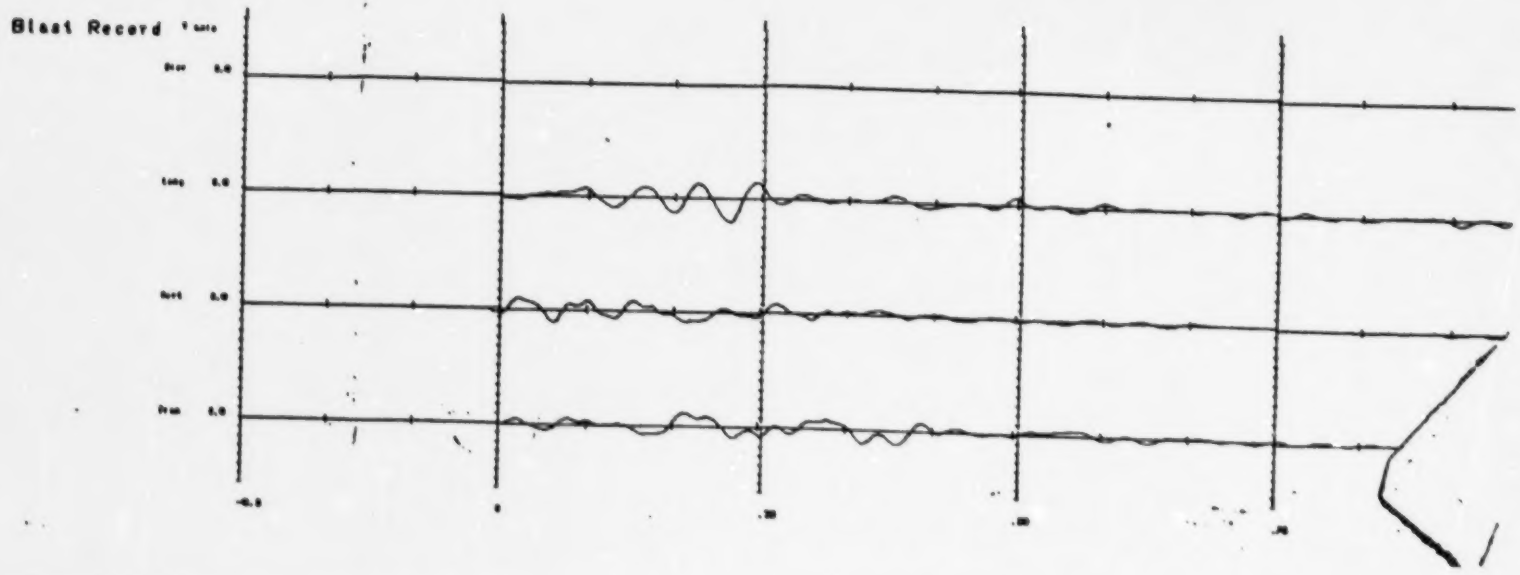
USER'S NAME: RM
USER'S FIRM: SRCL
LOCATION: M1.2
RANGE SELECT: 1 in/s 25 mm/s
TRIGGER SOURCE: Geo
TRIGGER LEVEL: 0.07 in/s 1.8 mm/s
RECORD TIME: 1 Sec.

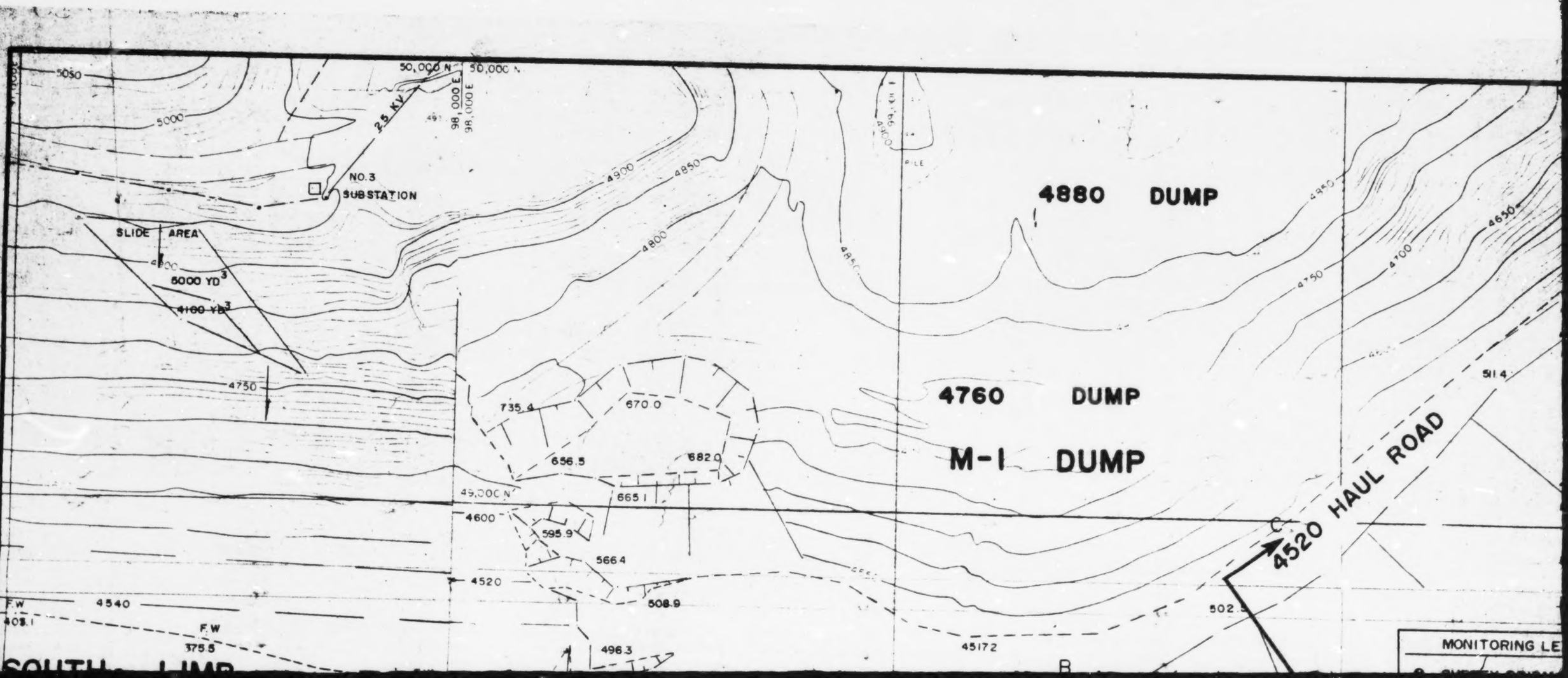
Triggered on: Vert chan.
14:35:21
12/20/87 (m/d/y)

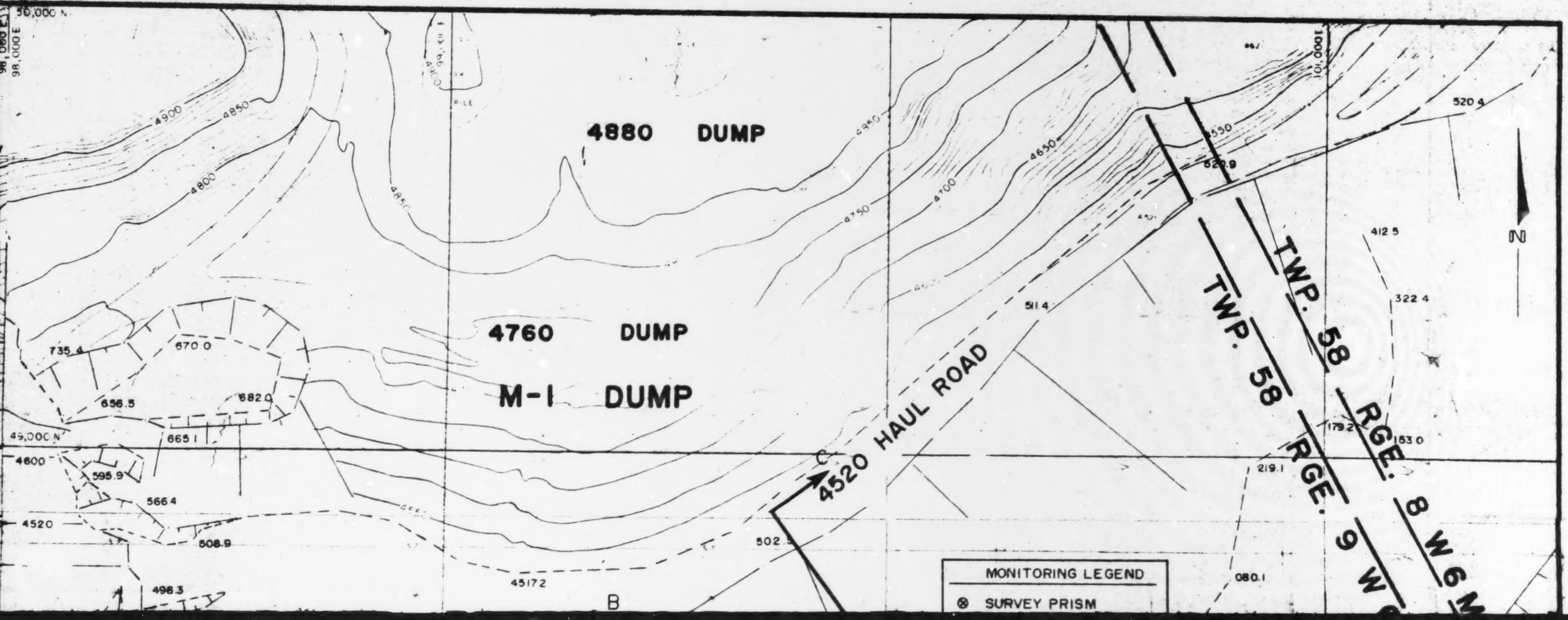
PSPL: < 110 dB

PPV:
Tran 6.00 mm/s
177 ms 10 hz
Vert 5.00 mm/s
19 ms 18 hz
Long 10.40 mm/s
219 ms 17 hz

PVS: 11.00 mm/s




50,000 N
98,000 E
25 KV
NO.3
SUBSTATION
SLIDE AREA
5000 YD³
4160 YD³
4880 DUMP
4760 DUMP
M-1 DUMP
4520 HAUL ROAD
735.4
670.0
656.5
682.0
665.1
595.9
566.4
508.9
496.3
4540
4520
4600
4750
4900
4850
4800
5050
5000
F.W
403.1
F.W
375.5
45172
511.4
502.5
MONITORING LE


98,000 E
50,000 N
4880 DUMP
4760 DUMP
M-1 DUMP
4520 HAUL ROAD
TWP. 58 RGE. 9 W6M
TWP. 58 RGE. 8 W6M
49,000 N
MONITORING LEGEND
SURVEY PRISM
N

SOUTH LIMB

M-1 DUMP

DUMP TOE

SLUMPED WASTE MATERIAL

ROAD OFFSET

SPRING/ SMALL POND

SPRING (30 ft SOUTH)

LIMIT OF ACTIVE FAILURE (FROM PAEL REPORT - MAR. 85)

SLUMPED MATERIAL

INTERCEPTOR DITCH

SOUTH PIT

LOCATION OF INITIAL BLASTING

SLUMPED MATERIAL

R.M. HARDY (TH 14)

R.M. HARDY (TH 13)

MONITORING LEG

SURVEY PRISM

VIBRATION MON

TEST HOLE LOC (PRE DUMP)

PIEZOMETER LOC

MI-1

MI-2

MI-3

MI-4

MI-5

A

A'

B

B'

MONITORING LEGEND

- SURVEY PRISM
- VIBRATION MONITOR
- TEST HOLE LOCATION (PRE DUMP)
- PIEZOMETER LOCATION

M-I DUMP

R.M. HARDY (TH 12)

R.M. HARDY (TH 13)

R.M. HARDY (TH 14)

SLUMPED MATERIAL

SLUMPED MATERIAL

INTERCEPTOR DITCH

SOUTH PIT

SOUTH PIT HAUL ROAD

LIMIT OF ACTIVE FAILURE (FROM PAEL REPORT - MAR. 85)

LOCATION OF INITIAL BLASTING

MI-1

MI-2

MI-3

MI-5

A

A'

B

B'

C

C'

12

11

10

9

8

5

4

3

2

6

4520

45172

92175

39028

4006.4

3670

3750

3800

SCALE 0 100 200